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SOUTH
ON THE
BONES

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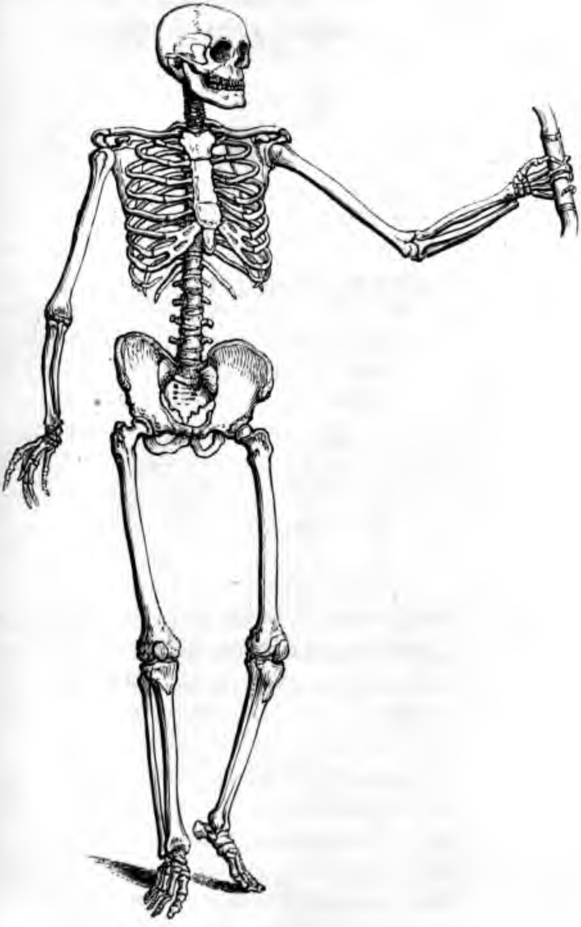

A DESCRIPTION
OF
THE BONES,
TOGETHER WITH
THEIR SEVERAL CONNEXIONS WITH EACH OTHER, AND
WITH THE MUSCLES; SPECIALLY ADAPTED
FOR
Students in Anatomy.

BIBLIOTHECA · BODLEIANA ·

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ASSISTANT-SURGEON TO ST. THOMAS'S HOSPITAL.

ILLUSTRATED WITH NUMEROUS ENGRAVINGS BY BRANSTON.

THIRD EDITION,
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PREFACE.

In presenting to the Profession a Third Edition of this little Work, I trust that its altered form will tend considerably to improve its usefulness. The employment of pictorial illustration as auxiliary to descriptive Anatomy, is now so general, and the increased facility it affords to the Student so fully admitted, that I feel no apology necessary for the introduction of Wood-cuts as explanatory of the text. It is not intended to compete with the magnificent "*Osteographia*" of Cheselden, which must ever be considered one of the finest specimens of engraving and anatomical fidelity; but the great value and rarity of that noble work remove it beyond the reach of most persons, and its large size would, even if it were easily procured, render it inconvenient for constant reference.

I have, therefore, availed myself of Mr. Branston's able assistance, in providing for the Student a pocket companion on that section of Anatomy which, if perfectly understood, renders every other comparatively easy. The Drawings for the several subjects, have been made from the bones themselves, and are not, as is commonly the case, copied from other works, with the exception of the frontispiece from Cheselden, and some parts of the Ear, which have been taken from Soemmering's great work, "*De Auditu,*" and which are acknowledged.

The entire section on the bony structure of the Ear I have added more fully than at first intended; and I hope the description here given will remove the difficulty so commonly felt in acquiring a knowledge of that beautiful, though complicated apparatus.

JOHN F. SOUTH.

2, ADELAIDE PLACE, LONDON BRIDGE,
December 1, 1836.

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A DESCRIPTION OF THE BONES.

CHAPTER I.

Of the Skeleton.

THE Bones are those hard parts of the Human Body which are composed principally of phosphate, with a small portion of carbonate of lime, deposited in an organized substance, consisting of gelatine, and plentifully supplied with vessels, for the purpose of nourishment, and growth.

They serve as a frame-work to the soft parts; protect the more important organs; and afford a series of levers, by means of which, through the agency of the muscles, locomotion is performed.

The Bones together form

THE SKELETON,

which is said to be either NATURAL or ARTIFICIAL.

It *is called* a NATURAL SKELETON, when the bones *are kept together* by their natural ligaments; but this kind is of little use for practical purposes, since the extremities of the bones, which are very important, as forming the joints, are so completely covered, that their form cannot be seen. It, therefore, becomes necessary to remove all the soft parts, and join the bones together with wires; and thus is produced the ARTIFICIAL SKELETON.

The Skeleton consists of two hundred and forty-nine bones, which are divided into those of the Trunk, Extremities, and Head; some of them are single, and others in pairs. They are

Of the Trunk 54.	Vertebræ	24
	Costæ	24
	Sternum	2
	Ossa innominata	2
	Os sacrum	1
	— coccygis	1
Of the Extremities 132.	Claviculæ	2
	Scapulæ	2
	Ossa humeri	2
	Ulnæ	2
	Radii	2
	Ossa carpi	16
	—— metacarpi	10
	Phalanges digitorum manus	28
	Ossa sesamoidea	4
	—— femoris	2
	Patellæ	2
	Tibiæ	2
	Fibulæ	2
	Ossa tarsi	14
	—— metatarsi	10
	Phalanges digitorum pedis	28
	*Ossa sesam*oidea	4
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Of the Head 63.	Os frontis	1
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	Os sphenoides	1
	— ethmoides	1
	Ossa malarum	2
	—— maxillaria superiora	2
	—— nasi	2
	—— lachrymalia	2
	—— palatina	2
	—— turbinata	2
	Vomer	1
	Os maxillare inferius	1
	Dentes	32
	Os hyoides	1
		249

Before proceeding with the description of the Bones, it will be necessary to speak of

THE TERMS

generally used in describing *relative position*, or the relation which one part bears to another.

The anatomist supposes the body erect, with the arms in such position that the palms of the hands are turned forwards, and the lower extremities so placed, that the knees and toes are directly in front. The terms, by which relative position is usually denoted, with their several senses, are as follow. By *superior* and *inferior*, we signify higher and lower with respect *to the summit of the head;* by *anterior* and posterior, we *denote the situation* of the parts as nearer to the fore or the hinder surface of the body; and by *laterally* to the *right* or *left*, we understand that the parts so described approach the one side or the other. *Inner* and *outer* express the relation of any given part or portion of the body to an imaginary plane, assumed by anatomists for the purpose of distinct conception or description, and named by them the *Median* plane, it being supposed to bisect the body into lateral halves, passing through the middle of the head and trunk, and continued between the inferior extremities: *inner* denotes an approach to, *outer* a removal from, this imaginary plane. The terms *external* and *internal*, *without* and *within*, are used only in speaking of cavities.

CHAP. II.

Of the Bones of the Trunk.

THE Trunk is composed of the Spine, Thorax, and Pelvis.

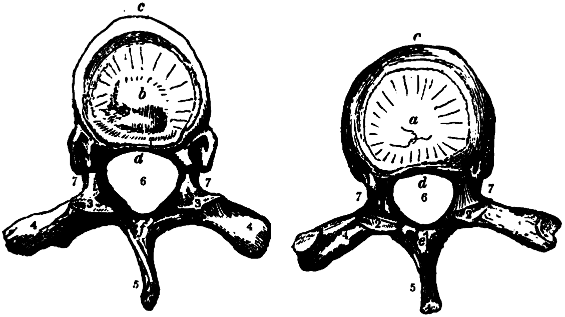
1. THE SPINE, *Columna Spinalis*,

Consists of twenty-four bones called VERTEBRÆ, which are piled one upon the other, the lowest resting upon the sacrum, and the uppermost supporting the head.

THE VERTEBRÆ.

Each VERTEBRA consists of a body, seven processes, a hole, and four notches.

The body, *corpus* (1), is the thick strong part situated in the front, of an irregular oval or rounded form; flat or slightly concave above (*a*) and below (*b*), convex laterally before (*c*, *c*), and hollowed behind (*d*), where it forms part of the spinal hole. The processes are, four articular, two transverse, and one spinous process.



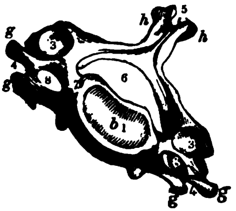
Of the articular processes, *p. articulares*, which join the back part of the body, and form the sides of the spinal hole, the two *superior* (2, 2) have their articulating surfaces facing backwards, and a little outwards, whilst the two *inferior* (3, 3) face forwards, and rather inwards. From the roots of the superior articular processes extend outwards, or outwards and backwards, the transverse processes, *p. transversi* (4, 4), very strong and thick, which are particularly for the attachment of muscles. From between the superior and inferior articular processes extends backwards, or backwards and downwards, the spinous process, *p. spinosus* (5); this is sharp above (*e*), concave below (*f*), and more or less hooked downwards.

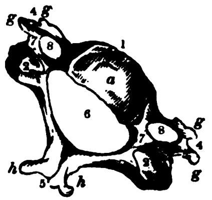
By the junction of the processes with the back part of the body of the vertebra, the spinal hole *foramen vertebrale* (6) is formed, which is either triangular or round, and through it passes the spinal marrow and its membranes. The roots of the articular processes are hollowed out above and below into notches (7, 7, 7, 7), of which the inferior are very deep; these, when the vertebræ are fitted together, form holes on each side (see page 14), through which the nerves pass from the spinal canal.

DIVISION OF THE VERTEBRÆ.

The vertebræ are divided into three classes, the CERVICAL, of which there are seven, forming the neck; the DORSAL, or those of the back, which are twelve in number; and the LUMBAR, or those of the loins, consisting of five vertebræ. These three classes not only have remarkable general peculiarities, but also among themselves differ from each other.

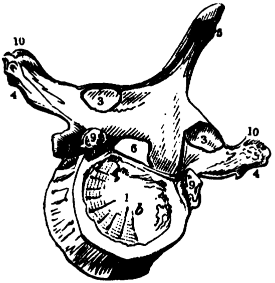
THE CERVICAL VERTEBRÆ are smaller than the others; their bodies (1) are longer from side to side; the upper surface (*a*) the largest, and concave laterally, the lower (*b*) the smallest, and concave from behind forwards; articular *processes* oblique, the superior (2, 2) oval, slightly convex, *facing* upwards and backwards; the inferior (3, 3)





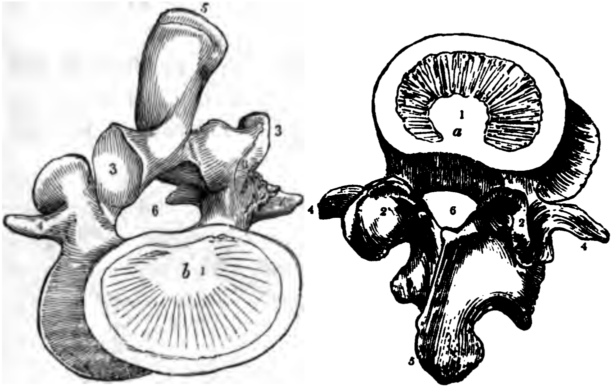
also oval, slightly concave, facing downwards and forwards; transverse processes (4, 4) short and thin, passing directly outwards from the body, and from the roots of the articular processes, having a hole (8, 8) in each for the transmission of the vertebral artery, and bifurcated (*g*) for the attachment of muscles; spinous process (5) short, horizontal, and bifid (*h*); spinal hole large and triangular (6); its upper edge sharp, its lower edge larger than the upper, and slightly rounded: the notches (7, 7) at the roots of the articular processes not so large as in the other vertebræ.

The dorsal vertebræ diminish in size from the first to the fourth or fifth, from which they increase to the twelfth, which is the largest of all. The body (1) is longer from before to behind, than from side to side, flat above (*a*) and below (*b*), and the inferior surface the largest; at the junction of the body with the arch, a half articular surface on the upper and lower margin (9, 9); these, when the vertebræ are put together, form an articular surface on each side, between every two dorsal vertebræ to receive the heads of the ribs: articular processes perpendicular and flat, the two superior (2, 2) facing backwards and



outwards, the two inferior (3, 3) forwards and inwards: transverse processes (4, 4) strong, extending outwards and backwards, having a concave articular surface (10, 10) on the front of their points for the tubercles of the ribs; spinous process (5) much hooked downwards, triangular, and sharp above and behind, hollowed before and below: spinal hole (6) round, notches larger than in the cervical vertebræ.

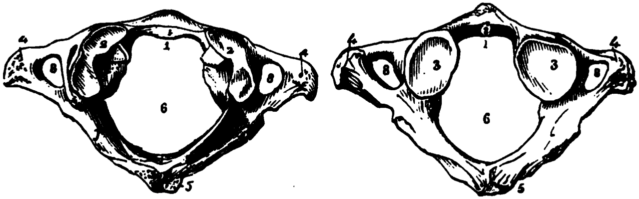
THE LUMBAR VERTEBRÆ are of larger size than the others, broader than their depth; their long axes from side to side, and slightly concave from behind to before, both above and below: articular processes perpendicular, the two upper (2, 2) concave, facing backwards and inwards, the two lower (3, 3) convex, facing forwards and outwards: transverse processes (4, 4) slender, and passing backwards and outwards, inclining at the same time rather upwards: spinous process (5) deep, long, *horizontal,* and flattened at the sides: spinal hole (6) *triangular: notches large.*

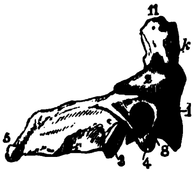


DIFFERENCES IN PARTICULAR VERTEBRÆ OF EACH DIVISION.

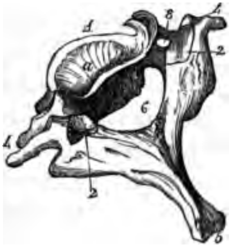
Among the CERVICAL VERTEBRÆ, the first, second, and seventh differ from the others.

The *first vertebra*, or *Atlas*, scarcely resembles a vertebra, consisting merely of a bony ring, the anterior part of which is hollowed out in place of the body (1), for the dentiform process of the second vertebra, and has an articular surface on its posterior surface (*i*) for the front of that process; the superior articular processes (2, 2) irregularly oval, their long axes from behind to before, concave in the same direction, and facing upwards and inwards; the inferior (3, 3) broad, and nearly flat, facing downwards and inwards: transverse processes (4, 4) not bifid but large, and originating from between the upper and lower articular processes, inclining slightly downwards; a groove (*j*) extending on each side from the back of the hole (8, 8) in the transverse process, along the upper edges of the arch, and winding round the back of the roots of the upper articular processes for the vertebral artery to make its turn: *spinal hole* (*6*) large: notches situated behind the *roots of the articular* processes.





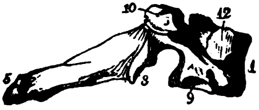
The *second vertebra*, *Axis vel Vertebra Dentata*, is remarkable for a strong tooth-like process or pivot, the dentiform process, *p. dentatus* (11), which rises from the upper part of the body (1), has an oval articular surface (*k*) on its front, and is received into the hollow of the Atlas: the superior articular processes (2) very broad and nearly flat, face upwards and outwards, and are situated immediately to the outside of the dentiform process; the inferior (3) placed below and behind them, face forwards and downwards: the transverse processes (4) very small and single, originate from the outsides of the superior articular processes; the holes (8) in them not perpendicular, but passing upwards and outwards: the spinal hole large: the superior notches behind the upper articular, the inferior before the lower articular processes.



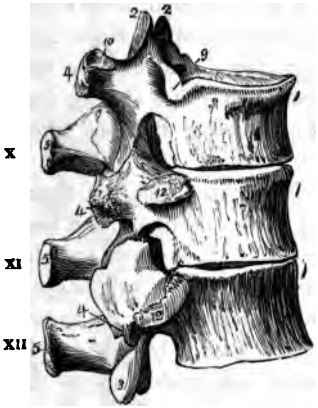
The *seventh vertebra* differs from the other cervical, in being larger, in having the transverse processes (4, 4) single, with a hole in each for the transmission of the vertebral veins, and a smooth surface on the front of their roots, over which the vertebral artery passes to enter into the holes in the transverse processes of the sixth; and in the spinous process (5) not being bifid but longer, and slightly hooked downwards like the dorsal.

Among the DORSAL VERTEBRÆ, the first, tenth, eleventh, and twelfth differ from the others.

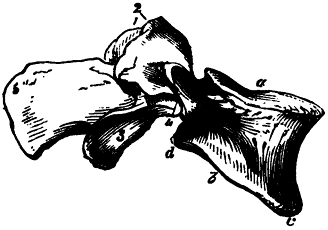
The *first* has a whole articular surface (12) on each side of the body for the heads of the first pair of ribs, besides the half surfaces (9) for the second pair.



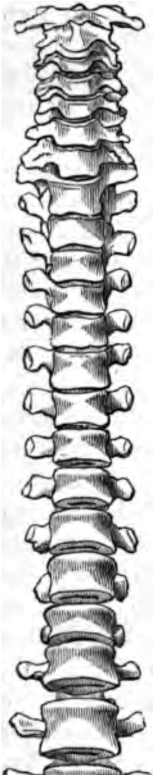
The *tenth* (X) has but one pair of half articular surfaces (9) on the body for the tenth pair of ribs. The *eleventh* (XI) and *twelfth* (XII) have whole articular surfaces (12, 12) for the two lowest pairs of ribs; the transverse processes (4) diminish gradually in size, so that those of the twelfth are the smallest, and those processes of the eleventh and twelfth have no articular surfaces upon them: the *twelfth* is further distinguished by having its inferior articular processes (3) convex laterally, and facing forwards and outwards.



Among the LUMBAR VERTEBRÆ, the *fifth* differs in having the lower surface (*b*) oblique instead of flat, so that the anterior edge (*c*) of the body is much deeper than the posterior (*d*); and the spinous process (5) is much hooked downwards.

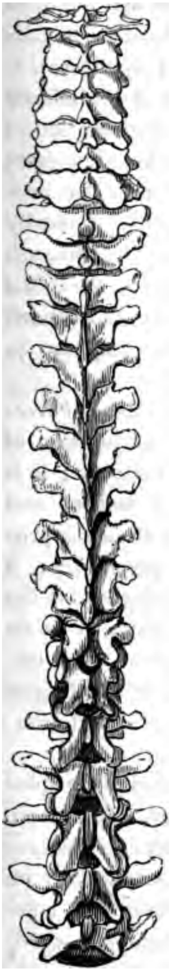


General Remarks on the Spine.



The vertebræ, when articulated together, form the Spine or Vertebral Column, which measures about one-third of the total height of the body, the other two-thirds being made up of the head, pelvis, and lower extremities. With regard to the proportions which the different divisions of the Spine bear to each other, the dorsal division will be found about two inches shorter than the cervical and lumbar divisions taken together.

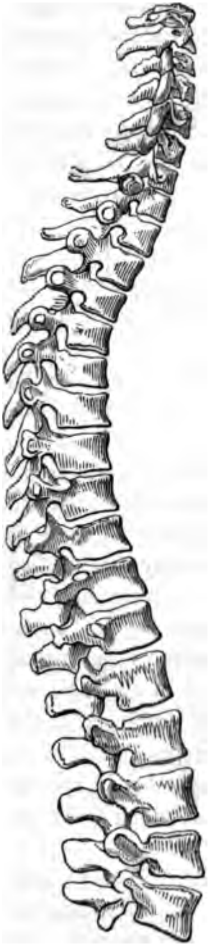
When viewed in front, the Spine appears of a pyramidal figure, the base of it resting upon the sacrum, and the apex supporting the head: but the apex is not the most tapering part; the bodies of the vertebræ gradually diminish in size, from the last lumbar up to the fourth or fifth dorsal, and from that they begin to enlarge up to the last cervical, from which again they diminish to the second cervical, which is very large in comparison with the four vertebræ immediately below it; and above that, the transverse processes of the first vertebra are seen much expanded beyond those of the other cervical vertebræ. With respect to the diminution of size in the middle of the dorsal ver-



tebræ, it is probably intended to give room for the important viscera contained in the Thorax, of which they form a large part of the posterior boundary; and to this end some anatomists have described a curve on the left side to give room for the aorta. M. Beclard, however, has shown that this circumstance merely depends upon the use of the right arm; for in persons who were left-handed, he found the curvature in the opposite direction.

In looking at the Spine posteriorly, the spinous processes are seen projecting in the middle; those of the cervical and lumbar vertebræ horizontally backwards, and those of the dorsal hooked downwards; on each side of these is seen a groove, formed by the junction of the arches of all the vertebræ, and bounded on the outside by the transverse processes, in which lie nearly all the muscles contained in the vertebral region. These being prominent in the recent state, leave a depression between them, in which the points of the spinous processes are felt extending from the head to the sacrum.

A lateral view of the Spinal Column presents anteriorly, two convexities and a middle concavity, the superior convexity formed by the lower cervical and



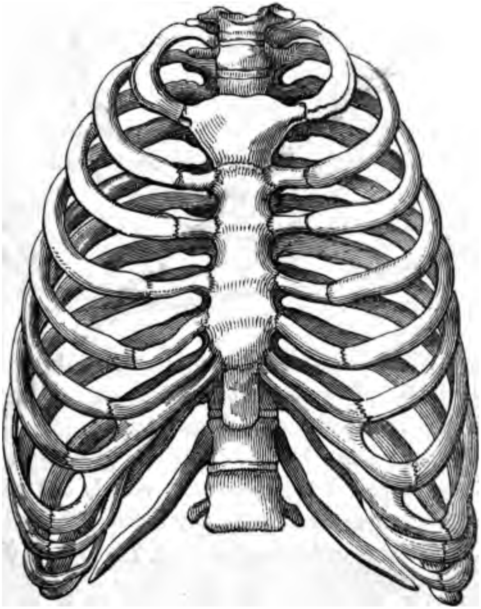
upper dorsal vertebræ, and the inferior by the lumbar; whilst the middle concavity is produced by the retrocession of the bodies of the middle dorsal vertebræ. Behind the bodies of the vertebræ, and between them and the roots of the articular processes, are seen the holes formed by the junction of the notches, through which the nerves pass from the spinal canal. And the different directions of the spinous processes may also be well seen in this view.

The Spinal Canal, *Canalis Vertebralis*, is formed by the junction of the arches of all the vertebræ; it is situated behind their bodies, and bounded by the roots of all the processes laterally and posteriorly; it forms a complete bony case for the spinal marrow, protecting it in its passage from the cranium to its termination in the sacrum: it is largest in the cervical and lumbar vertebræ; and smallest in the dorsal.

The *muscles* attached to the spine are, on the *back part*, M. trapezii, latissimi dorsi, rhomboidei majores & minores, levatores scapulæ, serrati postici superiores & inferiores, splenii, complexi, sacro-lumbales, cervicales descendentes, trachelo-mastoidei, longissimi dorsi, transversales colli, spinales & semispinales dorsi, semispinales colli, recti capitis postici majores & minores, obliqui capitis superiores & inferiores, multifidi spinæ, interspinales, intertransversales, & levatores costarum; on the *fore part*, M. longi colli, recti capitis interni majores & minores, recti capitis laterales, scaleni antici, medii & postici, diaphragma, quadrati lumborum, psoæ magni & parvi, obliqui interni & transversales abdominis.

2. THE CHEST, *Thorax*,

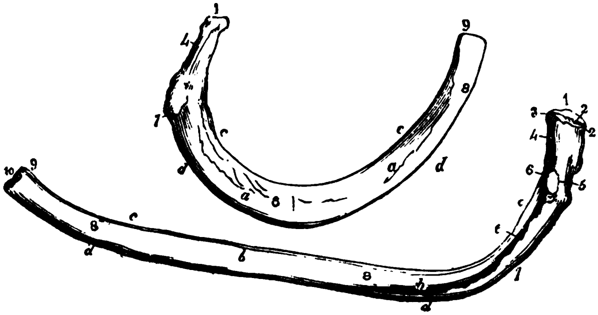
Is formed by twelve pairs of RIBS, two bones of the STERNUM, and the twelve DORSAL VERTEBRÆ already described.



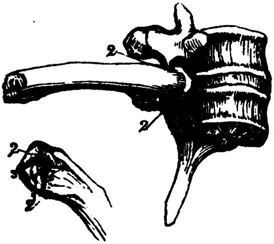
THE RIBS. *Costæ.*

Situation. They are placed on each side of the dorsal vertebræ, and form with them the posterior and lateral parts of the Thorax. They are divided into true, false, and floating ribs; of these the *true*, the seven superior, are articulated to the sternum; whilst the *false*, the three below the true, join by their cartilages to each other; and the *floating* ribs, or two lowest, have their anterior extremities unattached to each other and terminating in the muscles.

Description. The form of the ribs is very irregular.



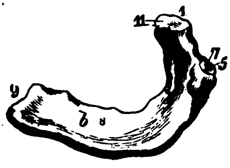
Each rib consists of two extremities with an intermediate body, which is more or less curved forwards and inwards, flat without (*a*) and within, (*b*) rounded above (*c*) and sharp below (*d*), with a groove (*e*) along its inferior edge for the intercostal vessels and nerves; *the posterior* or vertebral extremity is called the *head* (1), *which has two articular surfaces* (2, 2) upon it divided by a middle ridge (3), to articulate with the bodies of the dorsal vertebræ; immediately to the outside of the head, the bone is contracted to form the *neck* (4), which is marked by the capsular ligament; a little to the outer, under, and back part of the neck is the *tubercle* (5), having a plane *articular surface* (6) for the transverse process of the vertebra; further outward, the bone becomes suddenly bent forwards, and produces the *angle* (7); from which proceeds the *body* (8, 8), which passes forwards and inwards, inclining at the same time downwards, to terminate at the *sternal extremity* (9), which becomes deeper, and has an oval concave surface (10) in which the cartilage is received.



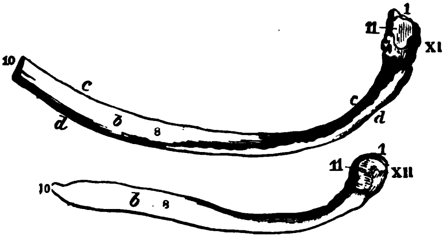
Differences in Particular Ribs.

No two pairs of ribs resemble each other in length, or in the direction of their curvature; the first pair is the shortest, the second longer than that, and so on till the seventh pair; when they begin again to decrease in length to the twelfth, which is nearly as short as the first pair: and with regard to the direction of their curvature, that of the first is nearly horizontal, whilst the lower pairs dip down more and more at their points. But there are other more remarkable distinctions in the first, eleventh, and twelfth ribs.

The *first rib is* very short and much curved; its *body (8, 8) is very thin*, and broad above and below, with a smooth and slightly hollowed surface near its sternal extremity, over which the subclavian artery passes; its head (1) has only a single articular surface (11) by which it joins to the whole articular surface on the side of the body of the first dorsal vertebra; and the tubercle (5), which is very large, is placed immediately upon the angle (7) of the bone, so that some anatomists describe it as wanting the angle.



The *eleventh* and *twelfth* ribs are shorter than all the others, except the first; their heads (11, 11) have only single articular surfaces to join with the whole articular cavities on the sides of the lowest dorsal vertebræ, and have no angles; their anterior extremities (10) although tipped with cartilage, are not attached to the cartilages of the other ribs, but are floating amongst the muscles, from whence they have been called *floating ribs;* and not having tubercles, they are not connected with the transverse processes of the vertebræ.

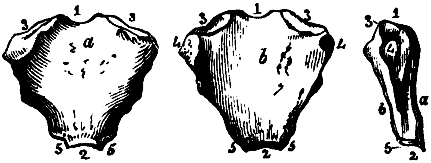


The *muscles* attached to the ribs are the M. pectorales *majores and minores,* subclavii, sterno-thyroidei, scaleni *antici, medii & postici,* latissimi dorsi, serrati majores antici, superiores & inferiores postici, sacro-lumbales, accessorii ad sacro-lumbalem, longissimi dorsi, levatores & depressores costarum, intercostales, sterno-costalis, diaphragma, obliqui externi & interni, tranversales & recti abdominis, & quadrati lumborum.

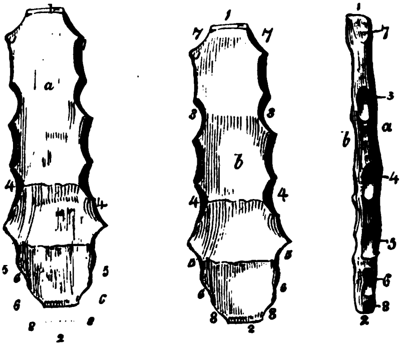
THE BREAST-BONE. *Sternum.*

Situation. In the front of the chest and connected with the ribs and clavicles. It consists of two bones.

Description. The *first bone* is of a triangular shape, the base (1) of which is above, very thick, and forms the fore and upper boundary of the chest; the apex (2) below and truncated, having an irregular articular surface for the second bone: it is irregularly convex before (*a*) and concave behind (*b*): at the top, on each point (3, 3) is an articular surface, concave from side to side for the sternal extremities of the clavicles, and between them the top of the bone is rounded: on each side and below these, is a large whole articular surface (4, 4) for the cartilages of the first pair of ribs: the sides of the bone become contracted, and at the lower part is a half articular surface (5, 5) for the second rib.



The *second bone* is long and narrow, flat before (*a*) and behind (*b*): at the top it has an articular surface (1) for the first bone, and below, a smaller one (2) for the ensiform cartilage, which has a half articular surface for the seventh rib, and in old people is converted into bone: on either side it has four whole concave articular surfaces (3, 4, 5, 6) for the third, fourth, fifth, and sixth ribs,



and two half ones for the second and seventh, that at the upper part (7) being for the second, and that at the lower (8) for the seventh, which is not very distinct from the whole one for the sixth rib.

The *muscles* attached to the sternum are the M. pectorales majores, sterno-mastoidei, sterno-hyoidei, sterno-thyroidei, sterno-costalis, & intercostales interni.

General View of the Thorax.

The Thorax, composed of the dorsal vertebræ, sternum, and ribs with their cartilages, resembles a cone, the base of which is below, and the apex above: the base is very wide, particularly in a transverse direction, and is remarkable for a deep notch, which is bounded laterally *by the margins of* the cartilages of the ribs, and has projecting *into it from* above, the point of the ensiform cartilage : the apex is truncated, leaving an oval opening, which is longest from side to side, through which pass the trachæa, the œsophagus, the great vessels of the upper extremities and head, and the nerves of the thoracic and abdominal viscera.

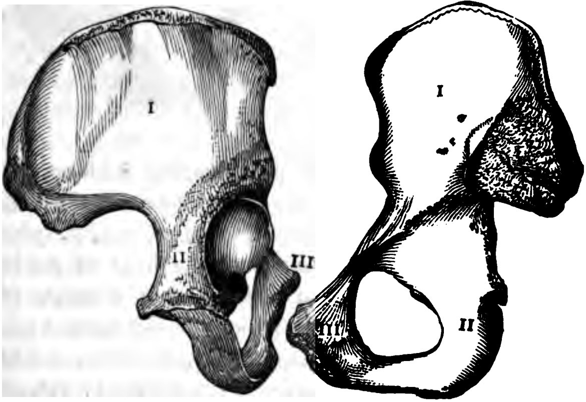
As to the relative proportions of the thorax in the male and female, in the former it is highest, and in the latter widest.

3. THE PELVIS

Is the large bony cavity situated at, and forming the lowest part of the trunk, by means of which its weight is transmitted to the lower extremities. It consists of a pair and two single bones, the OSSA INNOMINATA, OS SACRUM, and OS COCCYGIS.

UNNAMED BONES, *Ossa Innominata.*

A pair.

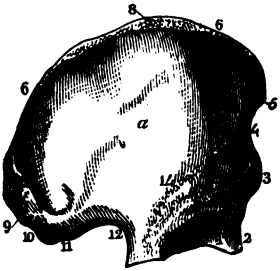


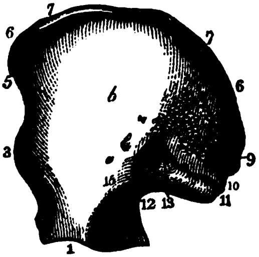
Situation. On the sides and front of the Pelvis. *Each Os Innominatum* is usually described as consisting of three portions, viz., OS ILII, OS ISCHII, and OS PUBIS, into which it is found divided in the young subject: but at the age of puberty or soon after, the three pieces become united and form one bone.

a. HIP-BONE. *Os Ilii* (I.).

Situation. At the upper and outer part of the pelvis, and forming the projection called the Hip.

Description. The lower part of the bone, forming the upper part of the *acetabulum*(1), or articular cavity, for the head of the thigh bone, has above it a smooth surface (2), over which the M. psoas magnus & iliacus pass from the abdomen: bounding this to the outer side, and above, is the inferior anterior spinous process, *p. spinosus anterior inferior*(3), to which one head of the M. rectus femoris is attached; above it is a notch (4) bounded superiorly by the superior anterior spinous process, *p. spinosus anterior superior*(5), to which the M. tensor vaginæ femoris & sartorius are attached: extending backwards and upwards, and then backwards and downwards is the crest, *crista*(6, 6), which has an inner

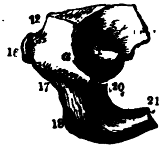


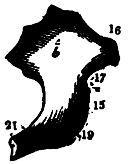


and outer lip, *labium internum* (7) *et externum* (8), to which the M. obliquus externus & internus, & transversalis abdominis, quadratus lumborum & latissimus dorsi are attached: the crest is terminated behind by the superior posterior spinous process, *p. spinosus posterior superior* (9): below which is a small notch (10) bounded inferiorly by the inferior posterior spinous process, *p. spinosus posterior inferior* (11): and from between the two processes originate the M. sacro-lumbalis & longissimus dorsi: before this the bone appears cut out to form part of the greater ischiatic notch, *incisura ischiatica major* (12), and from thence begins the Ischium: on the inside of the posterior spinous processes, is a large irregular articular surface for the sacrum (13), with which it forms the sacro iliac symphysis, or bird's head articulation. The ilium is of an irregular fan-like shape, the handle of which forms the upper part of the acetabulum; it is irregularly convex without (*a*), and this part is called the back, *dorsum*, which is marked by a curved line (14) extending in a curved direction from the superior anterior spinous process to the middle of the ischiatic notch, below which the M. gluteus minimus arises, and above it the M. gluteus medius: the inside (*b*) is called the belly, *venter*, it is concave and smooth, giving origin to the M. iliacus; from the middle of the articular surface for the sacrum, an obtuse edge extends forwards to the junction of the bone with the os pubis, as if the bone were pinched up; it forms part of the brim of the pelvis, *linea iliopectinea* (15), into which the M. psoas parvus is inserted.

β. The Haunch-bones. *Os Ischii.*

Situation. At the outer and under part of the pelvis, and forming the back and under part of the acetabulum.



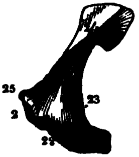


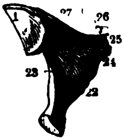
Description. Continuous from that part of the ischiatic notch (12), at which the ilium terminates, is the Ischium, forming the front of the greater notch, the lowest boundary of which is marked by a blunt spinous process, *p. spinosus* (16) giving origin to the superior head of the M. gemini & coccygeus and the anterior sacro-ischiatic ligament, opposite to which the bone is very thick, forming the back and under part of the acetabulum (1). Below the spinous process is another notch, the lesser ischiatic notch, *incisura ischiatica minor* (17), bounded below by the broad tuberosity, *tuber* (18), which has an irregular surface upon it, broadest behind and covered with cartilage, upon which we sit, and giving origin to the abductor and adductor muscles of the thigh and the flexors of the leg: on the inside of the tuberosity is a groove (19) in which the pudic artery and vein lay; above the tuberosity, between it and the under part of the acetabulum, is a groove (20), over which the tendon of the M. obturator externus plays: extending forwards and upwards is the leg, *crus* (21), obtuse within, where it gives attachment to the crus penis and M. erector penis; and sharp without, where it forms part of the *foramen obturator; and* about the middle of this, on its inner side, *it terminates in* the crus of the os pubis.

γ. The Share-bone. *Os Pubis.*

Situation. In the front of the pelvis, and forming the inner and under part of the acetabulum.

Description. Continuing upwards from the crus of the ischium, is the leg, *crus* (22), of the Pubis, the outer edge (23) of which forms part of the obturator foramen, and the inner rough to form the *symphysis* (24) or junction of the two ossa innominata: at right angles with the crus, and extending outwards, is the angle, *angulus* (25), immediately before which is the spinous process, *p. spinosus* (26), to which Poupart's ligament is attached; extending outwards is the body, *corpus* (27), smooth above, forming the flat surface over which the iliac vessels and the anterior crural nerve pass; sharp below to form the upper part of the obturator foramen, and sharp behind (14) to complete the linea iliopectinea: at the outer extremity, the body becomes thick and hollowed to form the fore and under part of the acetabulum (1).



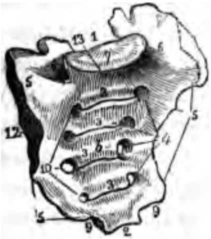


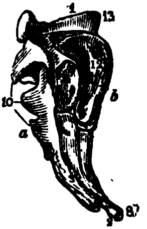
The *muscles* attached to and covering the os innominatum, are the M. psoas magnus & parvus, iliacus, levator ani, obturator internus, pyriformis, coccygeus, obliquus externus & internus, transversalis, rectus & pyramidalis abdominis, quadratus lumborum, longissimus dorsi, sacrolumbalis & latissimus dorsi, tensor vaginæ femoris, sartorius, gluteus maximus, medius & minimus, rectus femoris, gemini, quadratus femoris, biceps flexor cruris, semitendinosus & semimembranosus, transversus perinæi, & trans*versus perinæi* alter, erector penis vel clitoridis, tri*ceps adductor* femoris, gracilis, pectineus & obturator *externus.*

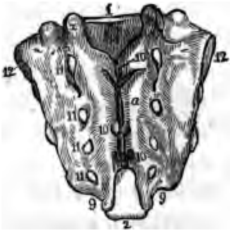
THE RUMP-BONE. *Os Sacrum.*

Situation. In the back of the pelvis, supported by the ossa innominata on the sides, and receiving the Vertebral Column above.

Description. The sacrum is of a triangular shape, its base (1) facing upwards and forwards, its apex, which is truncated (2), also facing forwards : it is concave before (*b*) from above downwards, and irregularly convex behind (*a*) in the same direction : in the young subject it consists of five pieces, which, from their general resemblance to the vertebræ, have been called the false vertebræ, but in the adult they are anchylosed into a single piece: in the anterior concave surface are four transverse lines (3, 3, 3, 3) marking the original separation into the five bodies, and on each side of these are the four anterior sacral holes, *foramina sacralia anteriora* (4, 4, 4, 4), bounded by the transverse processes, *p. transversi* (5) ; the upper transverse processes very broad, and having a notch (6, 6) between them and the articular surface on the base, to form part of the holes for the last pair of lumbar nerves : on the base or upper part, an oval articular surface (7), *its long axis from* side to side, and facing upwards and *forwards for the* body of the last lumbar vertebra : the







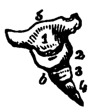
apex or lowest part having an oval articular surface (8) for the os coccygis, and a notch (9, 9) on each side of it for the last pair of sacral nerves: on the posterior surface, at the top, are seen the articular processes (*x*, *x*), which receive those of the last lumbar vertebra: in the middle are four processes, answering to the spinous processes (10) of the vertebræ, which are generally bifid, and occasionally so completely as to leave the spinal canal open, and this is generally the case with the two lowest: on either side of these are four holes, *foramina sacralia posteriora* (11), for the passage of small branches of nerves and vessels: the sides of the sacrum are of an irregular triangular shape with the base above, and having an articular surface (12) for the os innominatum. In consequence of the base of the sacrum facing forwards and upwards, the anterior margin projects considerably, and this is called the *promontory* (13) of the sacrum.

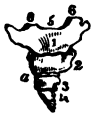
The *muscles* attached to the sacrum are the M. latissimi & longissimi dorsi, sacro-lumbales, multifidi spinæ, glutei maximi, pyriformes & coccygei.

THE COCCYX. *Os Coccygis.*

Situation. At the tip of the os sacrum.

Description. The Coccyx consists of three or four pieces (1, 2, 3, 4), in shape resembling the sacrum, and moveable upon it, and one another, till late in life, when they become anchylosed into a single bone: the upper is the largest, and the lower the smallest piece; they have plain oval





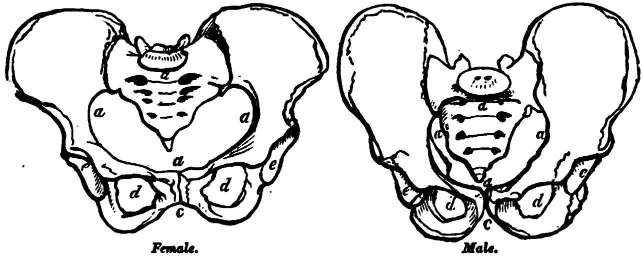
concave articular surfaces above and below for each other; the upper surface (5) of the first piece is the largest, and receives upon it the point of the sacrum: behind and to the outer sides of this surface are two little horns, *cornua* (6, 6), giving attachment to ligaments: the lowest point of the last piece is rounded: the lateral edges answering to transverse processes are thin and sharp: neither piece is perforated by the spinal canal.

The *muscles* attached to it are the M. coccygei.

General View of the Pelvis.

The Pelvis, composed of the ossa innominata, os sacrum, and os coccygis, is divided into two cavities by the linea iliopectinea, which extends from the front on either side as far as the sacro-iliac symphysis, sharp before and obtuse behind.

The upper cavity, or *false pelvis*, is only partial, being deficient in front; its lateral and posterior parts are formed by the bellies of the ilia, and the fore part is completed by the abdominal muscles, against which the abdominal viscera rest.


Brim.

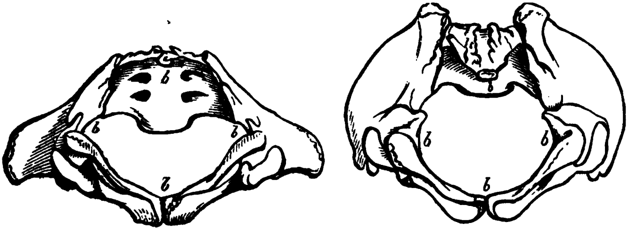
Female. *Male.*

The lower cavity, or *true pelvis*, is bounded anteriorly by the ossa pubis and ischii, laterally by the ossa ischii, and a small portion of the ossa ilii, and posteriorly by the os sacrum and os coccygis. It contains in the male the bladder and rectum; and in the female, besides them, the vagina and uterus.

The upper opening is called the brim, *facies abdominalis* (*a*, *a*, *a*, *a*): its figure resembles the shape of the heart painted on cards, the point of which is placed in front. The diameter of the brim differs much in the male and female pelvis, in the former it is greater from pubis to sacrum, in the latter from ilium to ilium.

The lower opening is named the *outlet*, (*b*, *b*, *b*, *b*) it is of an irregular diamond shape, and having the points before, behind, and on the sides: in the male it is comparatively small, but in the female very large, and within the latter the greatest extent is from pubis to sacrum, on account of the sacrum not being so much curved as in the male.

Outlet.

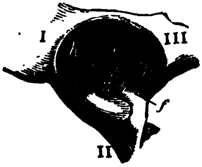


Female. *Male.*

The *cavity*, or *true pelvis*, is placed between the brim and the outlet; it is deepest posteriorly, not so deep laterally, and shallowest anteriorly.

Forming the front of the true pelvis are the pubes, *the junction of* the rami of which at the symphysis produces the *arch of the pubis* (c); this in the male is very acute, but in the female it is obtuse for the purpose of increasing the size of the outlet to facilitate delivery.

On each side of the arch of the pubis is the large obturator hole, *foramen obturator* (*d*), formed by the ischium and os pubis: it is of an oval shape with the long axis vertical, and its margin is very sharp for the attachment of ligaments, except at the upper and outer part, where it is rounded for the passage of the obturator artery, vein, and nerve.



On each side and still further outwards is the articular cavity for the head of the thigh-bone, *acetabulum* (*e*), formed by the junction of the ilium (I.), ischium (II.), and pubis (III.): it is of a deep cup-like shape, with its concavity facing outwards and a little downwards: its margin is not completely circular, but deficient at the under and fore part forming a notch (*f*), which space in the recent state is filled up with ligament; the upper, outer, and under part of the acetabulum is smooth, but opposite the notch it is scooped out, forming a cavity (*g*) to which the round ligament is attached, surrounded by a quantity of fat: the upper and outer part (*h*) of the acetabulum, by which the weight of the body is transmitted to the head of the thigh-bone, is the deepest, and the under and fore part the shallowest. The proportions in which the ilium, ischium and pubis enter into the composition of the acetabulum are, the upper and outer part not quite two-fifths of the whole cavity by the ilium; the under part rather more than two-fifths by the ischium; and the fore part, one-fifth by the pubis.

With respect to the axis of the pelvis, it is so placed that the trunk does not rest upon the outlet, but upon the tuberosities of the ischia, so that the outlet faces downwards and backwards, and the brim upwards and forwards, in such way, that a line raised perpendicular with the middle of the brim, will pass upwards and forwards through the umbilicus. This oblique bearing of the pelvis is particularly important in surgical and obstetric practice connected with the pelvis.

The differences between the male and female pelvis, may briefly be said to consist in the greater lateral diameter of the brim, in the greater extent of the outlet, in the greater width of the arch of the pubis, and the greater distance between the acetabula in the female than in the male.

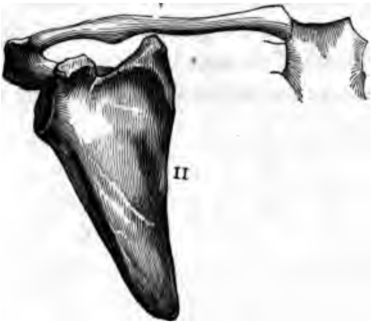
CHAP. III.

Of the Upper Extremity.

The Upper Extremity consists of the SHOULDER, UPPER ARM, FORE ARM, and HAND; these are connected by the clavicle to the trunk, which is their only bony union; the other connections being by muscles.

1. THE SHOULDER. *Scapula.*

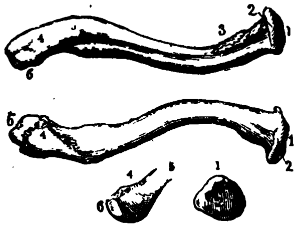
Consists of the CLAVICLE and SCAPULA.



THE CLAVICLE. *Clavicle* (I.).

Situation. At the upper part of the chest, horizontally between the sternum and the scapula.

Description. The clavicle, so called from its resemblance to an ancient key, is divided into body, two extremities, two articular surfaces, and two processes. Its shape is that of a small Italic *ſ*, and it is placed horizontally; its inner or *sternal extremity* (1) is very large, and irregularly cylindrical; upon its point is a large articular surface (2), by which it joins with the interarticular cartilage placed between it and the sternum; about an inch from the sternal extremity on the under edge is a rough surface, the rhomboid process, *p. rhomboides* (3), by which it is attached to a ligament; it then becomes smooth and rounded, projects forwards, and afterwards backwards, having the hole for the medullary artery on its under surface, and about three-fourths from the sternal extremity projects forward again, becomes considerably expanded, and forms the *scapular extremity* (4), which is the flattest part of the bone; about an inch and a half from the outer point, and on its under surface, is a rough process called the tubercle, *tuber* (5), for the attachment of ligaments; and upon the outer part of the scapular extremity a plane articular surface (6) for the acromion of the scapula.



Connection. With the first bone of the sternum by its inner, and with the acromial process of the scapula by its outer extremity.

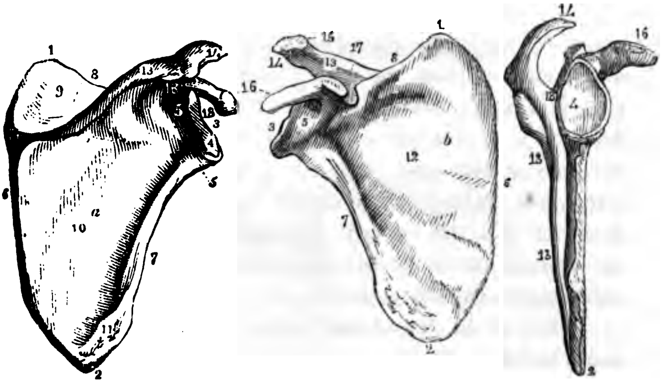
The *muscles* attached to the clavicle are six, to its *under part M.* pectoralis major, deltoides, & subclavius;

and to its *upper* part M. trapezius, sterno-mastoideus, & sterno-hyoideus.

THE BLADE BONE. *Scapula* (II).

Situation. On the posterior and superior part of the chest.

Description. The scapula is of a triangular figure consisting of three angles, three edges, three pits, three processes, two articular surfaces, and two notches.



The inner and superior point is called the superior angle, *angulus superior* (1), the inner and inferior, the inferior angle, *angulus inferior* (2), and the outer and superior, the outer angle, *angulus externus* (3); the outer angle has a slightly concave oval articular surface upon it called the glenoid cavity, *cavitas glenoides* (4), by which the os humeri articulates with the scapula, and around it the bone is contracted and forms the neck, *cervix* (5); the edges, *costæ*, are the *inner* or base (6) between the superior and inferior angles, the *inferior* (7) between the inferior and external angles, and the *superior* (8) between the external and internal angles: the body of the bone is divided behind or upon the *dorsum* (*a*) into two pits, *fossæ*, of which the inferior is the larger, by the spine (13), the space above it is called the *fossa supraspinata* (9), and that below it the *fossa infraspinata* (10); on the inferior point of this is a triangular flat surface (11) immediately above the inferior angle, giving origin to the M. teres major; the front (*b*) of the bone forming the third pit is hollow, and called the *fossa subscapularis* or *venter* (12); the spine, *spina* (13), begins from the base, where it has a small smooth surface about an inch and a half below the superior internal angle, it passes outwards and upwards, and terminates in the acromion, *processus acromion* (14), which is expanded over the top of the glenoid cavity, and about an inch above it, forming the point of the shoulder; it is of a triangular figure, and has an articular surface (15) on its inner and anterior edge to join with the clavicle; the third process is the coracoid, *processus coracoides* (16), which originates by a thick root from the fore and upper part of the neck of the bone, and curves forwards and outwards before the glenoid cavity; the notches, *incisuræ*, are, *one* in the superior edge (17) at the root of the coracoid process, and to its inner side for the passage of the suprascapular artery, vein, and nerve; and *one* between the root of the glenoid cavity and the root of the acromion (18), through which the superior dorsal artery and vein pass to the fossa infraspinata.

Connection. By the articular surface on the acromion with the collar bone.

The *muscles* attached to the scapula are sixteen, viz: to the spine *above*, M. trapezius, and *below*, M. deltoides; to the base M. levator scapulæ, rhomboideus minor & major, & serratus magnus; to the notch in the superior costa, M. omo-hyoideus; to the fossæ, M. supraspinatus, infraspinatus & subscapularis; to the inferior costa, M. teres minor & triceps extensor cubiti (its long head); to the inferior angle, M. teres major; and to the coracoid process, M. coraco-brachialis, pectoralis minor & biceps flexor cubiti (its short head); the latter also from the upper edge of the glenoid cavity (its long head).

2. THE UPPER ARM, *Brachium*,

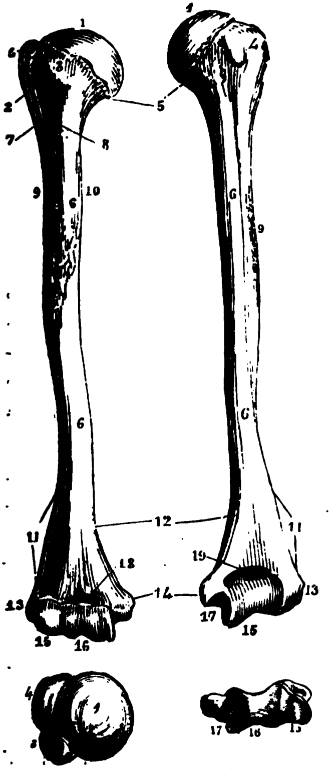
Consists of a single bone.

THE BONE OF THE ARM. *Os Humeri.*

Situation. On the side of the chest, forming the upper arm; attached to the scapula above, and to the radius and ulna below.

Description. The os humeri, or upper arm, is divided into the head, two tubercles, body, two condyles, three articular surfaces, and two pits.

The head, *caput* (1), which is hemispherical, is placed at the upper and inner part of the bone, facing upwards, inwards, and rather backwards, it is smooth to articulate with the glenoid cavity of the scapula, and around its edge are the marks produced by the attachment of the capsular ligament; on the outer and fore part are seen the two tubercles, separated by a groove, *sulcus bicipitalis (2),* for the tendon of the long head of the M. biceps, the anterior or lesser tubercle, *tuberculum minus* (3), giving insertion to the M. subscapularis, the external or greater tubercle, *tuberculum majus* (4), giving insertion to the M. supraspinatus, infraspinatus & teres minor; immediately below the head and tubercles the bone is contracted, and forms the neck, *cervix* (5); the body, *corpus* (6, 6), appears as if the upper part were twisted outwards and the lower inwards; the hole for the medullary artery, *foramen medullare*, is about one-third of the bone downwards; extending from the fore part of the greater tubercle downwards is the outer edge (7) of the bicipital groove, to which the M. pectoralis major is attached, and from the lesser tubercle the inner edge (8) of the same groove, to which the M. latissimus dorsi & teres major are attached; one-third down on the outside is a rough surface (9), to which the M. deltoides & brachialis internus are attached; at the same distance from the head, and to the inner side of the



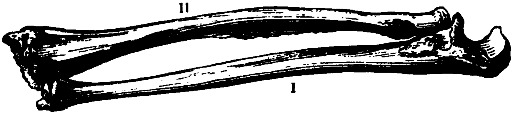
bicipital groove another rough surface (10) for the attachment of the M. coraco-brachialis & brachialis externus (one of the heads of the M. triceps): from the middle of the bone on the outside extending downwards to the outer condyle, is a line (11) giving origin to the M. supinator radii longus & extensor carpi radialis longior, and on the inside another line (12) passing to the inner condyle; between these two lines the M. brachialis internus arises before, and the M. brachialis externus behind; the outer condyle, *condylus externus* (13), which is at the outer side of the lower end of the bone, projects but little, it gives origin to the M. anconeus, extensor carpi ulnaris, extensor communis digitorum, extensor carpi radialis brevior & supinator radii brevis; the inner condyle, *condylus internus* (14), at the inside of the lower end of the bone, projects very much inwards, it gives origin to the M. pronator radii teres, and all the long flexors of the hand and fingers, except the M. flexor digitorum profundus; the lowest part of the bone has two articular surfaces upon it, that on the outside convex (15) from before to behind, and from side to side, for the head of the radius; and that on the inside convex (16) from before to behind, and concave from side to side, for the sigmoid cavity of the ulna; between this articular surface and the inner condyle behind, is a groove, *sulcus ulnaris* (17), for the ulnar nerve: above the articular surfaces before, is a pit (18) for the coronoid process of the ulna, and behind another (19) deeper for the olecranon of the ulna; around the condyles there are ligamentous marks.

Connection. With the scapula above, and with the radius and ulna below.

The *muscles* attached to the os humeri are twenty-four; viz. M. deltoides, supraspinatus, infraspinatus, teres minor, subscapularis, pectoralis major, latissimus dorsi & teres major, coraco-brachialis, triceps extensor cubiti, brachialis internus, palmaris longus, flexor carpi radialis, flexor carpi ulnaris, flexor digitorum sublimis perforatus, flexor longus pollicis, pronator radii teres, supinator radii longus & brevis, extensor carpi radialis longior & brevior, extensor carpi ulnaris, extensor digitorum communis, & anconeus.

3. THE FORE ARM, *Antibrachium*,

Consists of two bones, the ULNA and RADIUS.

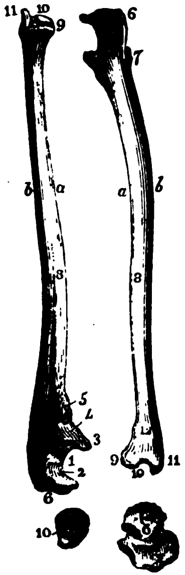


THE CUBIT. *Ulna* (I).

Situation. On the inside of the fore arm, attached above to the os humeri, on the outer side to the radius, and below by means of an interarticular cartilage to the os cuneiforme.

Description. The ulna is divided into a body, extremities, four processes, and four articular surfaces.

The upper extremity is very large, scooped out anteriorly to form the greater sigmoid cavity, *cavitas sigmoidea major* (1), which faces forwards, and is divided by a middle ridge (2), for the inner articular surface of the base of the os humeri, and bounded before by a projecting lip called the coronoid process, *processus coronoides* (3); on



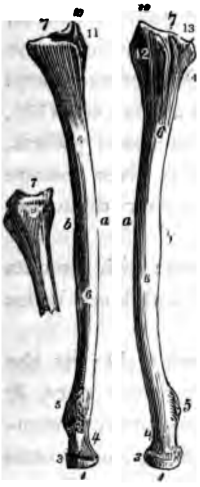
the outer side, between the olecranon and the coronoid process, is a concave articular surface for the head of the radius, the lesser sigmoid cavity, *cavitas sigmoidea minor* (4); below, and before the coronoid process, is another process called the tubercle, *tuber* (5); the greater sigmoid cavity is bounded behind and above by the olecranon, *processus olecranon* (6), which forms the projecting part of the elbow, gives insertion to the M. triceps extensor cubiti behind, and to the M. anconeus on its outer edge; it has a flat surface on the posterior part covered only by skin, which is strictly the place called the elbow, or *ancon* (7); the body of the bone, *corpus* (8), is strongly marked by the attachment of muscles; it is rounded and smooth on the inner, and sharp on the outer side, for the attachment of the interosseous ligament; about a third down is the hole for the medullary artery; the lower end of the bone is rounded, having a rounded articular surface (9) on its outer side for the base of the radius, and an irregular one (10) below for the interarticular cartilage; on the inside it is lengthened to form the styloid process, *processus styliformis* (11), and on the back is a slight groove (12) for the M. extensor carpi ulnaris.

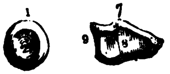
Connection. With the humerus above: with the radius on the outside; and by the interarticular cartilage with the cuneiform bone below.

The *muscles* attached to the ulna are fifteen; viz. M. brachialis internus, triceps extensor cubiti & anconeus, pronator radii teres, flexor carpi radialis, flexor carpi ulnaris, flexor digitorum communis sublimis & profundus, supinator radii brevis, pronator quadratus, extensor carpi ulnaris, extensor ossis metacarpi pollicis, extensor primi internodii pollicis, extensor secundi internodii pollicis & indicator.

THE SMALL BONE OF THE ARM. *Radius* (II).

Situation. On the outside of the fore arm, attached above to the os humeri, on the inner side to the ulna, and below to the os scaphoides and lunare.





Description. The radius is said to resemble the spoke of a wheel; it is divided into head, neck, body, base, two processes, four articular surfaces, and four grooves.

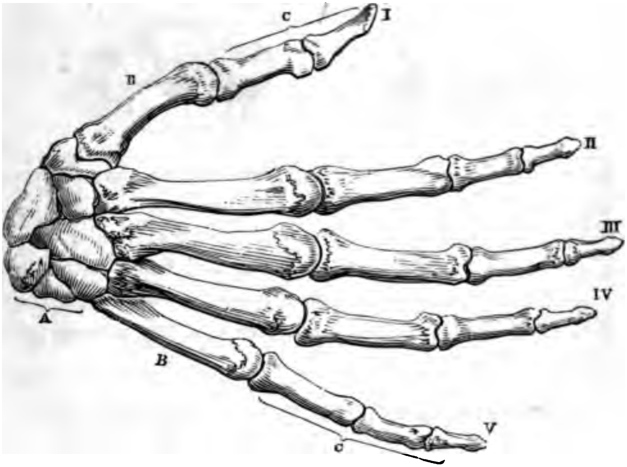
The head or upper part, *caput* (1), is rounded, having a concave articular surface at the top (2), to receive the convex articular surface of the outer condyle of the os humeri; on the side of the inner and anterior half of the head is an articular surface (3), by which it joins with the lesser sigmoid cavity of the ulna; immediately below this the bone is contracted to form its neck, *cervix* (4), bounded below on the fore and inner part by an obtuse process called the tubercle, *tuber* (5), into which the tendon of the M. biceps flexor cubiti is inserted; the body, *corpus* (6, 6), is rounded along its outer edge (*a*), and sharp within (*b*), to give attachment to the interosseous ligament: the lower end of the bone is much expanded, forming the base, *basis* (7), which has a triangular concave articular surface (8), with its apex outwards for the scaphoid and lunar bones, sometimes divided by a ridge; on the inside it has a concave articular surface (9) for the lower extremity of the ulna; on the outer edge it is extended to form the styloid process, *processus styliformis* (10), and has a groove (11), through which pass the tendons of the M. extensor ossis metacarpi & extensor primi internodii pollicis, and on the back three other grooves, the largest of which is the outermost (12), for the tendons of the M. extensor carpi radialis longior & brevior; next to it is a small one (13), for that of the M. extensor secundi internodii pollicis, and the innermost (14), nearest the ulna gives passage for those of the M. indicator & extensor digitorum communis.

Connection. With the humerus above; with the ulna on the inside; and with the scaphoid and lunar bones below.

The *muscles* attached to the radius are eight; viz. the M. supinator radii longus & brevis, pronator teres, & quadratus, biceps flexor cubiti, flexor digitorum communis sublimis, flexor pollicis longus, & extensor ossis metacarpi pollicis.

4. THE HAND, *Manus*,

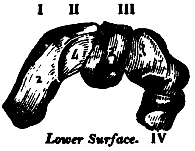
Consists of the CARPUS, METACARPUS and PHALANGES; of these, part of the carpus (A) with the radius form the wrist joint; the metacarpus (B) forms the palm of the hand; and the phalanges (C) the fingers.

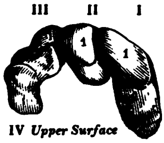


THE CARPAL BONES. *Carpus.*

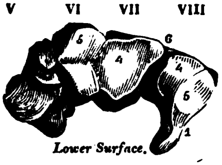
Situation. Between the fore arm and hand.

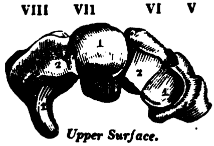
Description. They consist of eight bones forming an arch, supported by ligament, the concavity of which is placed before, and the convexity behind. These eight bones are arranged in two rows, four in each; they are, in the *first* row, on the outside the os scaphoides (I), on its inner side the os lunare (II), next it the os cuneiforme (III), and on the front of that bone the os pisi-



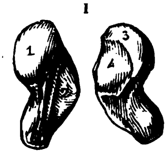


forme (IV): in the *second* row, on the outside is the os trapezium (V), next to it, the os trapezoides (VI), to its inner side, the os magnum (VII), and next to that the os unciforme (VIII). Of these bones the first row is articulated above with the radius, and the interarticular cartilage at the extremity of the ulna, and below with the second row; the second row articulates above with the first row, and below with the bases of the metacarpal bones.*





THE SCAPHOID BONE. *Os Scaphoides* (I).



Description. The scaphoid bone somewhat resembles a boat in shape; it has four articular surfaces, one above (1), the largest, is convex, and of a triangular shape, with its apex outwards for the base of the radius; one on the back and under part also convex (2), for the os trapezium and os trapezoides; one on the inner and upper part small and flat (3), for the lunar bone; and one below it and on the inside concave (4), to form part of the socket for the head of the os magnum: the rest of the bone not occupied by articular surfaces is strongly marked by ligament.

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* The surfaces figured on the upper and lower surfaces of these rows of the carpus are referred to in the description of the single bones to save repetition.

Connection. Above to the radius, below to the trapezium & trapezoid, on the inner side to the lunar, and below it to the large bone.

There are no *muscles* attached to this bone.

THE LUNAR BONE. *Os Lunare* (II).

Description. The lunar bone is said to resemble a half moon, its convexity being placed upwards; it is largest on its fore part, and projects into the carpal arch; it has four articular surfaces; one above convex (1), for the radius; one below concave (2), which with that of the scaphoid bone, forms the cup for the head of the os magnum; one on the outside flat (3), for the scaphoid bone; and one on the inside also flat (4), for the cuneiform bone.

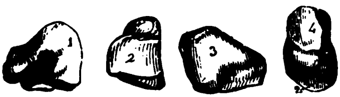
II

Connection. With the radius above, and the large bone below, with the scaphoid on the outer, and the cuneiform on the inner side.

No *muscles* attached to this bone.

THE CUNEIFORM BONE. *Os Cuneiforme* (III).

Description. The cuneiform bone is said to resemble a wedge, the base of which faces outwards, and the apex inwards; it has four articular surfaces; a small one on its upper and outer edge (1), for the interarticular cartilage, which is attached to it; another on the outside (2), for the lunar bone; one below slightly and irregularly concave (3), for the unciform bone; and a flat one on its fore part (4), for the os pisiforme.



Connection. Above with the interarticular cartilage of the ulna, below with the unciform bone, on the outside with the lunar, and before with the pisiform bone.

No *muscles* attached to this bone.

THE PISIFORM BONE. *Os Pisiforme* (IV).

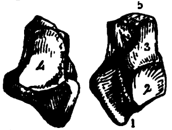
Description. This bone is named from its resemblance to a large pea; it is rounded before (1), and has a flat articular surface behind (2).

Connection. With the front of the cuneiform bone.

The *muscles* attached to it are three; viz. the M. flexor carpi ulnaris, abductor minimi digitorum, & palmaris brevis.

THE TRAPEZIUM. *Os Trapezium* (V).

Description. Said to resemble the mathematical figure of that name, but of an irregular form; it is remarkable for a deep groove (1), on its fore part, through which the tendon of the M. flexor carpi radialis passes; it has four articular surfaces; one concave above (2), for the scaphoid bone; one on the inside (3), for the trapezoid bone; a large one on the outside (4), concave from above downwards, and convex from before to behind, for the metacarpal bone of the thumb; and a small flat one below (5), for part of the metacarpal bone of the fore finger, between that for the metacarpal bone of the thumb and that for the trapezoid bone.

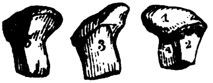


Connection. Above to the scaphoid, on the outside to the metacarpal bone of the thumb, on the inside to the trapezoid, and below to the metacarpal bone of the fore finger.

The *muscles* attached to it are four ; viz., M. flexor ossis metacarpi pollicis, abductor pollicis, abductor indicis & extensor ossis metacarpi pollicis.

THE TRAPEZOID BONE. *Os Trapezoides* (VI).

Description. The trapezoid bone, like the preceding, is also said to resemble the mathematical figure ; it is, however, of a very irregular shape, being broadest and smoothest behind (1), with its lower edge rounded: it has four articular surfaces, one above (2), for the scaphoid ; one on the outside (3), for the os trapezium ; one on the inside (4), for the os magnum ; and one below (5), for the metacarpal bone of the fore finger.

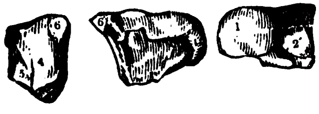


Connection. Above with the scaphoid, below with the metacarpal bone of the fore finger, on the outside with the os trapezium, and on the inside with the os magnum.

The only *muscle* attached to this bone is the M. flexor brevis pollicis.

THE LARGE BONE. *Os Magnum* (VII).

Description. This is the largest bone of the carpus, from whence it derives its name ; it has six articular surfaces ; it is sometimes called *os capitatum,* on account of the head or large hemispherical articular surface (1), at the upper part, which forms a ball to be received into a socket formed in the first row of the carpal bones by the scaphoid and lunar bones, which tends much



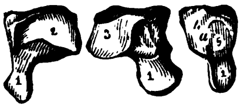
to strengthen the junction of the parts of the carpus to each other; on the outside, the large bone has an articular surface for the trapezoid (2), and on the inner (3), for the unciform bone; below, it has an irregularly concave surface (4), for the metacarpal bone of the middle finger, the outer edge of which (5) is pared off, as it were, to articulate it with a small portion of the metacarpal bone of the fore finger; and a similar but much smaller articular surface is found on the posterior and inner point (6), for the metacarpal bone of the ring finger.

Connection. Above with the scaphoid and lunar, on the outside with the trapezoid, and on the inner side with the unciform bone, below in the middle with the metacarpal bone of the middle, on the outside with that of the fore, and on the inside with that of the ring finger.

The only *muscle* attached to this bone is the M. flexor brevis pollicis.

THE UNCIFORM BONE. *Os Unciforme* (VIII).

Description. The unciform bone has a remarkable hook-like process (1), on its fore and inner edge, which curves outwards towards the root of the thumb; it has four articular surfaces; one large above and to the inner side (2) for the cuneiform; one on the outside (3), for the os magnum; and two below divided by a ridge (*a*), the outer smaller one (4), for part of the metacarpal bone of the ring finger, and the other (5), for the metacarpal bone of the little finger.



Connection. Above with the cuneiform, on the outside with the large bone, and below with the metacarpal bones of the ring and little fingers.

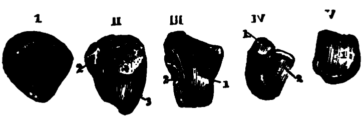
The *muscles* attached to this bone are three ; viz. the M. flexor brevis pollicis, flexor proprius, & adductor minimi digiti.

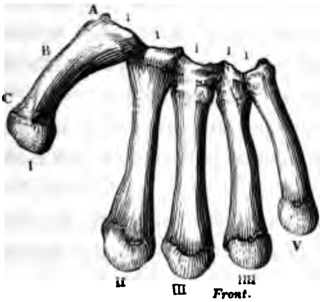
THE METACARPAL BONES. *Ossa Metacarpi.* (B.)

Situation. Below the carpus and above the fingers, forming the back and palm of the hand.

Description. Of the metacarpal bones there are five, each of which is divided into its upper part, or *basis* (A); middle or body, *corpus* (B); and lower part or head, *caput* (C), which forms the knuckle, and projects when the fingers are bent. Upon the bases are articular surfaces for the carpal bones ; the bodies behind are sharp above and expanded below towards the knuckles,* before they are expanded above and sharp below for the purpose of giving room for the M. interossei ; the heads of all except that of the thumb, are convex from before to behind and from side to side, having large articular sur-

Bases.





Front.

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* See page 43.

faces for the first row of the phalanges of the fingers; and immediately above the head is a groove for the attachment of the capsular ligament. They differ much from each other, particularly that

Of the *Thumb* (I), which very much resembles the first phalanx of the fingers: it is the shortest of all the metacarpal bones, and placed obliquely on the carpus, instead of perpendicularly like the other metacarpal bones; it is of the same breadth throughout, smooth behind, rounded from side to side before, and forming a sharp edge on either side: the articular surface on its base (1) is much expanded; it is convex laterally, and concave from before to behind, the anterior lip being much produced; its head is slightly convex from before to behind, but flat laterally.

Connection. With the trapezium above.

Of the *First Finger* (II). The basis of this bone has three articular surfaces divided by two edges, the middle and larger for the os trapezoides (1); the outer and smaller for the os trapezium (2); and the inner for the os magnum (3); immediately below the articular surface for the os magnum, is a plane surface on the side for the metacarpal bone of the second finger.

Connection. With the trapezium, trapezoid, and large bone above, and with the metacarpal bone of the second finger on the inside.

Of the *Second Finger* (III). The basis of this bone has an articular surface in the middle for the os magnum (1); one on the outer side of the base concave (2) for the base of the metacarpal bone of the first finger, and another on the inside for that of the third finger.

Connection. With the os magnum above, with the metacarpal bone of the first finger on the outside, and of the third finger on the inside.

Of the *Third Finger* (IV). The basis of this has two articular surfaces, a very small one at the upper and outer part (1) for the os magnum, and a large one on the upper and inner part (2) for the os unciforme; on each side of the base are articular surfaces for the metacarpal bones of the second and fourth fingers.

Connection. Above with the large and unciform bone; on the outside, with the metacarpal bone of the second, and on the inside with that of the fourth finger.

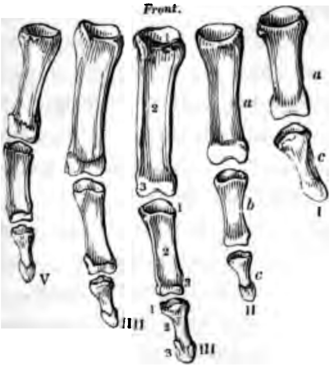
Of the *Fourth Finger* (V). The base has an articular surface above (1) for the os unciforme, and on the outside another for the metacarpal bone of the third finger.

Connection. With the os unciforme above, and the metacarpal bone of the third finger on the outside.

The *muscles* attached to the metacarpal bones are fifteen; viz. M. interossei (seven), common to all except that of the thumb; to that of the thumb *before*, M. flexor brevis & flexor ossis metacarpi pollicis, & abductor indicis, and *behind*, extensor ossis metacarpi pollicis; to that of the fore finger *before*, M. flexor carpi radialis, and *behind*, M. extensor carpi radialis longior; to that of the middle finger, M. extensor carpi radialis brevior, and to that of the little finger, M. extensor carpi ulnaris.

THE FINGERS. *Phalanges Digitorum.* (C).

The thumb and fingers of each hand consist of fourteen pieces or phalanges, of these twelve belong to the *fingers*, and are disposed in three rows, those of the middle finger being longest, and of the little finger shortest; whilst the thumb has but two, its middle phalanx being deficient, but they are stronger than those of the fingers. The phalanges consist of base (1), body (2), and head (3), and they taper from the base or upper part to the head, the intermediate part or body being rounded behind.* and flat before, with two projecting lateral edges to give attachment to the sheaths of the tendons.



In the *First Row* (*a*) the base (1) is concave from before to behind, and from side to side, in which direction it is longest; the head (3) has a pulley-like articulation upon it, concave laterally, broadest in front, and convex from before to behind.

In the *Second Row* (*b*), which is wanting in the thumb, the base (1) is concave laterally, and deepened before and behind in the middle by a lip, between which a ridge extends, dividing it into two smaller concavities: the body (2) and head (3) are like those of the first row, but the body is shorter.

In the *Third Row* (*c*) the phalanges become very taper, their bases (1) are like those of the second, but their points (3) are expanded into thin rough surfaces, which are rounded at the tip and give attachment to the nails.

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* See page 43.

The *muscles* attached to the phalanges are twenty-one; viz., *before*, M. flexor brevis digitorum sublimis, & profundus, flexor longus & brevis, & adductor & abductor pollicis, flexor proprius & adductor minimi digiti, lumbricales (four), & interossei (seven); *behind*, M. extensor digitorum communis & indicator.

SESAMOID BONES. *Ossa Sessamoidea.*

Of these there are usually two at the root of the first phalanx of the thumb; they are small bones, round before and flat behind; they give attachment to the M. flexor brevis pollicis manus; sometimes there are also some to the little finger.

CHAP IV.

Of the Lower Extremity.

The lower extremity consists of the THIGH, LEG, and FOOT, which are connected by the head of the thigh bone with the acetabulum.

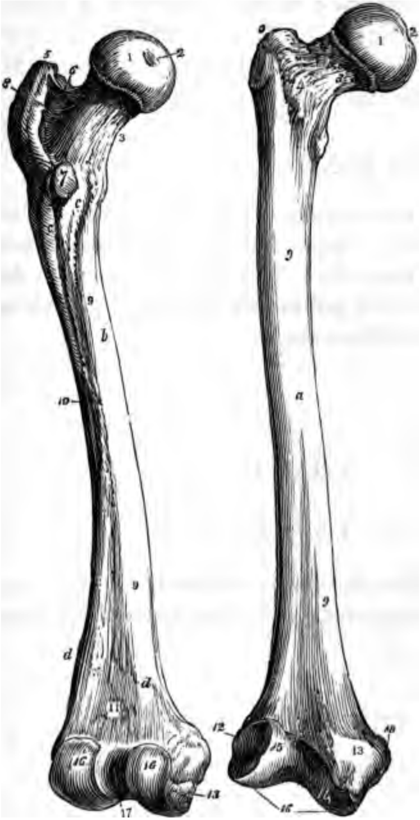
1. THE THIGH, *Femur*,

Consisting of a single bone.

THE THIGH BONE. *Os Femoris.*

Situation. In the thigh between the trunk above and the leg below.

Description. The os femoris is the largest bone in the body; it consists of a head, neck, and trochanters, or upper part; a body or middle; and condyles, or lower part.



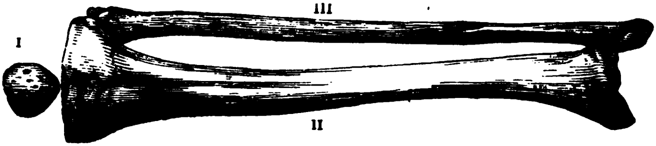
The head, *caput* (1), is situated at the upper and inner part of the bone, forming the greater part of a sphere, and presenting a large articular surface which faces upwards and inwards, and has a rough hole (2) in it, to which is attached the round ligament; extending outwards and downwards to join with the upper part of the body is the neck, *cervix* (3), which is broader below than above and flattest behind and before; a rough oblique line marks the extent of the neck and the attachment of the capsular ligament in front (4); the upper and outer part of the body projects above the neck, forming the greater trochanter, *trochanter major* (5), which is smooth on the outer and back part where the M. gluteus maximus passes over it; its upper part gives attachment to the M. gluteus medius & minimus, and has, on the inside, a deep pit, *fossa trochanterica* (6), to give insertion to some of the abductor muscles: about two inches below it, on the inner and back part of the bone, is a strong rounded projecting process, the lesser trochanter, *trochanter minor* (7), to which the M. psoas magnus & iliacus are attached; a curved line, *linea quadrata* (8), extending from one trochanter to the other, gives attachment to the M. quadratus femoris, and marks the termination of the neck and the attachment of the capsular ligament posteriorly: the body, *corpus* (9), is arched in front and slightly concave behind; it is smooth and slightly rounded before, but sharp in the middle behind, forming the rough line, *linea aspera* (10), which occupies the middle third of the bone, and divides above and below into two lines, the two upper (*c, c*) pass one into each trochanter, and the two lower (*d, d*) one into each condyle, having between them a flat triangular space, strictly called the Ham (11), in which the popliteal artery, vein, and nerve lay; the lower end of the bone becomes much expanded to form the condyles, *condyli* (12, 13), of which the inner (13) is considerably the larger and longer; upon the condyles are four articular surfaces, the *two upper* (14, 15) on the fore part for the patella, of which that on the outer condyle (15) is the larger, and separated from each other by a slight depression, and the *two lower* (16, 16) for the head of the tibia, extending very far backwards and upwards, and separated by a very deep pit (17), into which the crucial ligaments are inserted; these articular surfaces are broadest below and narrowest behind and above; on the inside of the inner condyle, and above its articular surface is a projection (18) more or less distinct, to which the M. adductor magnus femoris is attached. The medullary artery enters about the middle of the back of the bone.

Connection. By means of the head, with the acetabulum of the os innominatum above, and by the condyles below, with the tibia, and before, with the patella.

The *muscles* attached to this bone are nineteen: viz. to the *trochanter major*, M. gluteus medius & minimus; to the *trochanter minor*, M. psoas magnus & iliacus; to the *linea quadrata*, M. quadratus; to the *fossa trochanterica*, M. obturator internus & externus, gemini and pyriformis; to the *linea aspera*, M. gluteus maximus, pectineus, & triceps femoris, vasti & biceps flexor cruris; to the *condyli*, M. gastrocnemius externus, plantaris & popliteus; to the *fore part* of the body, M. crureus: the M. sartorius, gracilis, & tensor vaginæ femoris, are upon the os femoris, but not attached to it.

2. THE LEG. *Crus.*

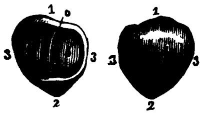
The leg is composed of three bones, the PATELLA, TIBIA, and FIBULA, which in their disposition are analogous to the bones of the fore arm, but with these two differences:—1st, that the patella which corresponds to the olechrănon of the ulna in its use as a protection to the joint, and as increasing the length of the lever on which the great extensor muscle of the limb acts, is a separate and moveable bone, instead of forming, like the olechranon, part of the bone itself; and, 2dly, that there is but the least possible motion between the two large bones, instead of the rotation of one bone upon the other, as in the fore arm.



THE KNEE CAP. *Patella* (I).

Situation. On the front of the knee and protecting the joint: it may be considered to bear the same relation to the tibia, which the olecranon does to the ulna.

Description. The patella is of a heart shape, with the base, *basis* (1), above, and the point, *apex* (2), below, the sides, *margines* (3), are between the base and point; it is convex laterally and from above downwards, and rough in front in consequence of the attachment of the tendon of the M. rectus, and the ligament of the patella; it has two articular surfaces (4, 5) behind, slightly concave, and divided by a middle perpendicular projecting ridge (6), the outer (4) of them being the larger.



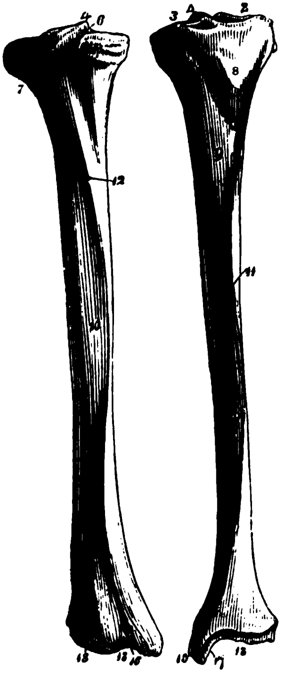
Connection. With the condyles of the os femoris behind.

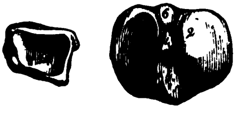
The *muscles* attached to the patella are four; viz. to the *basis*, M. rectus and crureus, and to the *sides*, M. vasti.

THE SHIN BONE. *Tibia* (II).

Situation. On the inside of the leg.

Description. The tibia is said to resemble an ancient flute in shape: it consists of a head or upper part, body or middle, base or lower part, two processes and six articular surfaces.





The head, *caput* (1), is much expanded, and of an oval form, with its long axis from side to side; on the top it has two semicircular articular surfaces (2, 3) for the condyles of the os femoris, of which the inner (3) is the larger; these are slightly concave, and have their diameters towards each other, separated by a middle ridge (4), having one pit before (5) and another behind it (6), to which the crucial ligaments are attached; on the posterior under and outer part of the head is a small flat articular surface (7) for the head of the fibula; about an inch below the head on the fore part is the tubercle, *tuber* (8), which gives attachment to the ligaments of the patella and some muscles; the body, *corpus* (9, 9) is of a prismatic form, the base (10) of which is behind, and the apex before, which latter presents a sharp ridge extending down to the inside of the base, and called spine or shin, *spina* (11); the inside of the body is very smooth and covered only by skin, the outside slightly hollowed for the lodgement of muscles, and the posterior irregularly flat and marked by an oblique line, *linea poplitea* (12), which extends from the articular surface for the fibula across to the inner edge of the bone, about a third downwards, and marks the attachment of the M. popliteus and gastrocnemius internus. The lower part of the bone is expanded to form the base, *basis* (13), which has an articular surface upon it (14), concave from before to behind for the top of the astragalus; on the inside the base is lengthened by a strong process, the inner ankle, *malleolus internus* (15) which is marked on the under back part by a slight groove (16) for the passage of the tendon of the M. tibialis posticus, and has a flat articular surface on the outside (17) for the inside of the astragalus; on the outside of the base is an irregular articular surface for the fibula (18). The hole for the medullary artery is in the middle and back part.

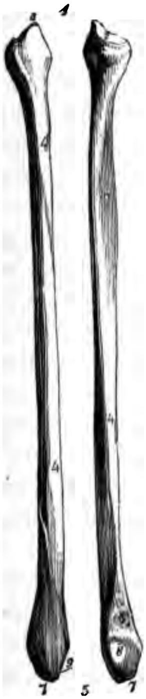
Connection. Above with the condyles of the os femoris, below and to the inner side with the astragalus, and on the outside to the fibula.

The *muscles* attached to this bone are ten; viz. below the *tubercle,* M. sartorius, gracilis, semitendinosus; to the back of the *head,* M. semimembranosus; to the *back of the head and body,* M. popliteus, gastrocnemius internus, tibialis posticus, flexor longus digitorum pedis; and to the *fore part of the head and body,* M. tibialis anticus & extensor longus digitorum pedis.

THE SPLINT BONE. *Fibula* (III).

Situation. On the outside of the leg, and forming a splint or support to the tibia.

Description. The fibula is of a very irregular shape, and composed of a head, body, base, two processes, and three articular surfaces.



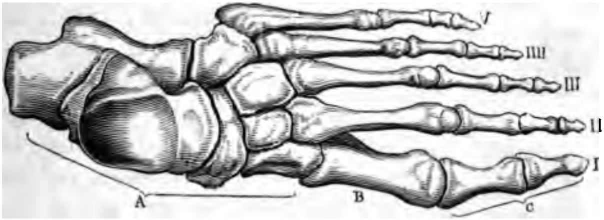
The head, *caput* (1), or upper extremity, is large and irregular, it has a smooth articular surface (2) on its inner side facing upwards and inwards to join it with the tibia, and on the upper and outer part a little projecting process, *processus bicipitalis* (3), for the attachment of the M. biceps flexor cruris : the body, *corpus* (4, 4), consists of several ridges and depressions for the origin and lodgement of muscles ; it becomes larger at the base, *basis* (5), which is smooth in front, and covered only by skin ; on its inner side is an irregular articular surface (6) to join it with the outside of the base of the tibia ; below the base is lengthened to form the outer ankle, *malleolus externus* (7), on the inside of which is an oblique articular surface (8) facing downwards and inwards for the outside of the astragalus ; the extreme outer point gives attachment to ligaments, and the posterior part (9) is grooved for the tendons of the M. peronei. The medullary artery enters in the middle of the posterior part of the bone.

Connection. On its inside above to the tibia, and below to that bone and the astragalus.

The *muscles* attached to this bone are eight: viz. to the *processus bicipitalis,* M. biceps flexor cruris; to the *fore part of the body,* M. extensor longus digitorum & extensor proprius pollicis pedis; on *the outside,* the M. peroneus longus & brevis; and *behind,* the M. gastrocnemius internus, tibialis posticus, & flexor longus pollicis pedis.

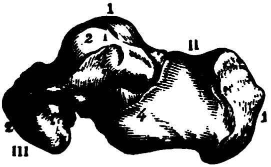
3. THE FOOT, *Pes,*

Consists of the TARSUS, METATARSUS, and TOES.



THE TARSAL BONES, *Tarsus* (A),

Like the carpus, form a kind of arch, under which tendons, vessels, and nerves pass into the sole of the foot. It consists of seven bones: the astragalus, os calcis, and os naviculare, form the first row; and the three ossa cuneiformia and os cuboides, compose the second row and support the metatarsus.*



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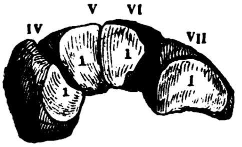
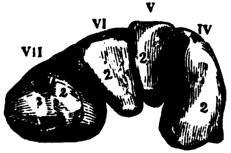
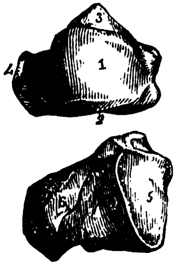
* Some of the articular surfaces are seen more distinctly when the bones are connected, and therefore are numbered here.





THE ASTRAGALUS. *Astragalus* (I).

Situation. At the upper and back part of the foot, and connecting it with the leg.



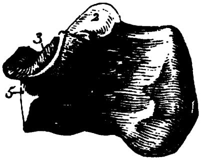
Description. Said to resemble an ancient die; it has six articular surfaces; it is convex above from behind to before, forming its largest articular surface (1) for the base of the tibia; on the inside it has a small articular surface (2) nearly flat for the inner malleolus; and on the outside it has a large articular surface (3) concave from above downwards and pointed below, for the outer malleolus: the fore part of the bone is rounded, forming the head (4), which is smooth, to articulate it with the os naviculare: the under part of the bone has two articular surfaces (5, 6) for the os calcis, separated by a deep groove (*a*), the posterior concave (5) from within to without, and the anterior slightly convex (6); those parts of the bone not occupied by articular surfaces are marked by ligament.

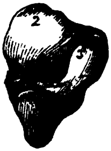
Connection. By its upper articular surface with the base of the tibia, on the inner side with the inner malleolus, on the outer with the outer malleolus; below with the os calcis, and before with the os naviculare.

The only *muscle* attached to this bone is M. tibialis posticus.

THE HEEL BONE. *Os Calcis* (II).

Situation. At the back, outer, and under part of the foot, projecting backwards to form the heel.





Description. The os calcis is the largest bone of the foot; it is of an irregular figure; it has three articular surfaces, is flat on the outside and concave on the inside; it is much lengthened behind to form the heel, or tuberosity, *tuber* (1); on the upper and fore part where the bone appears concave, are two articular surfaces for the astragalus, the posterior convex (2) and the anterior concave (3), the inner edges of which project much inwards, and form, with the inside of the tuberosity, a deep cavity, the *sinuosity* (4) through which the flexor tendons pass into the sole of the foot; at the fore and outer part of the bone is an irregular concave articular surface for the os cuboides (5).

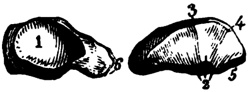
Connection. By the two superior articular surfaces with the astragalus, and by the anterior with the os cuboides.

The *muscles* attached to the os calcis are ten: viz. to the *upper part,* M. extensor brevis digitorum pedis; to the *under part,* M. abductor, flexor brevis & adductor pollicis pedis, flexor brevis & flexor digitorum accessorius, & abductor minimi digiti; the *back part,* M. gastrocnemius externus & internus, & plantaris.

NAVICULAR BONE. *Os Naviculare* (III).

Situation. On the inner and upper part of the foot before the astragalus.

Description. In shape resembles a boat, broad laterally, narrow from before to behind; it has three articular surfaces, one behind deep and concave (1) for the astragalus; another before convex (2), divided by two ridges (3, 4) for the three ossa cuneiformia; and on the outer edge of the articular surface for the outer cuneiform bone, a small articular surface (5) for the os cuboides; on the inner side of the bone is a strong projecting rounded process (6).



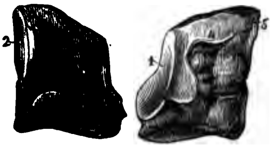
Connection. Behind with the astragalus, before with the ossa cuneiformia, and on the outer edge with the os cuboides.

The only *muscle* attached to this bone is, to its *under* part, M. tibialis posticus.

CUNEIFORM BONES. *Ossa Cuneiformia* (IV. V. VI.)

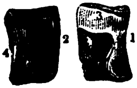
Situation. On the inner and upper part of the foot; they are three in number, and are called from their position, *inner*, *middle*, and *outer* cuneiform bones.

Description. The *inner* cuneiform bone (IV) is the largest of the three, it is of an irregular prismatic shape, its base placed below and the apex above; it has four articular surfaces, one behind concave (1) to form part of the articulation for the navicular bone; it has a plain articular surface before (2) for the metatarsal bone of the great toe; its inner face is slightly

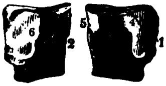


convex, and has a smooth surface on its under and fore part (3), to which the M. tibialis anticus and peroneus longus are inserted; its outer face is irregularly concave, and has on its upper edge an irregular flat articular surface (4) for the middle cuneiform bone, and a smaller surface before it (5), for the inside of the metatarsal bone of the second toe; its under surface and the other parts not smooth for articulation, are strongly marked by ligament.

The *middle* cuneiform bone (v), which is of a prismatic shape and the smallest of the three, has its base above slightly convex laterally: it has four articular surfaces; one behind, concave (1) for the navicular; one before, flat (2) for the base of the second metatarsal bone; one on the inside, nearly flat (3) for the inner cuneiform; and one on the outer and posterior part, slightly concave (4) for the outer cuneiform bone.



The *outer* cuneiform bone, in shape resembling the preceding and having its base upwards, has five articular surfaces, one concave behind (1) for the navicular; two before, the inner (2) for the third metatarsal, and a very small one on the outer corner (3) for part of the fourth metatarsal; two on the inside, the posterior (4) of which is for the middle cuneiform, and the anterior (5) for the second metatarsal; and a large one on the outside (6) for the cuboid bone.



Connection. The three cuneiform bones form a cup* behind, into which is received the rounded articular surface of the navicular bone; before they join with the three larger metatarsal bones; and in consequence of the shortness of the middle cuneiform bone, a kind of mortise* is formed by the inner and outer, in which the second metatarsal bone is received like a tenon; the middle cuneiform bone articulates on the inside with the inner, and on the outside with the outer cuneiform bones; and the outer cuneiform joins by its outer surface with the cuboid and with the fourth metatarsal bone.

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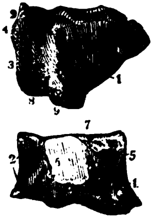
* See page 62.

The *muscles* attached to these bones are five; viz. to the *inner*, M. tibialis anticus & peroneus longus; to the *outer*, M. flexor brevis & adductor pollicis pedis; and to *all three bones*, M. tibialis posticus.

CUBOID BONE. *Os Cuboides.*

Situation. On the outer part of the foot, immediately before the os calcis.



Description. Of an irregular cuboidal form, its outer edge being the shortest: it has three articular surfaces, the largest of which is behind and concave (1) for the os calcis; the anterior (2, 3) slightly concave and divided by a middle perpendicular ridge (4) into two for the fourth (2) and fifth (3) metatarsal bones; and the smallest on the inside (5, 6) divided by a ridge (7) into two unequal portions, of which the smaller and posterior (5) is for the outer and under edge of the navicular, and the larger anterior (6) for the outer side of the outer cuneiform bone: above, the bone is convex; and below, *it has a deep* groove (8) through which the tendon of the

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* See page 62.

M. peroneus longus plays ; the ridge, which bounds this behind, terminates externally in a protuberance (9) the posterior part of which marks its junction with the os calcis.

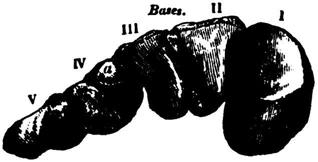
Connection. With the fore part of the os calcis behind, with the two small metatarsal bones before, and on the inside behind with the navicular, and before with the outer cuneiform bone.

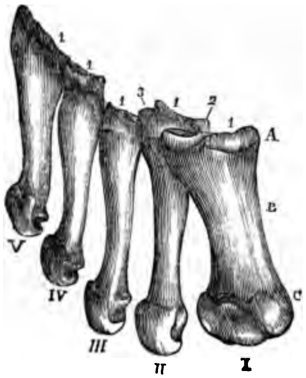
The *muscles* attached to this bone are two; viz. on its *under* surface, M. flexor brevis minimi digiti & adductor pollicis pedis.

THE METATARSAL BONES. *Metatarsus.* (B.)

Situation. Between the tarsus and toes.

Description. The metatarsus consists of five bones,* of which the first, or that of the great toe, is the shortest and largest, and that of the second the longest. Like the metacarpus they have *bases* (A), the broadest and hindmost part, all which have flat articular surfaces to join them with the tarsus ; and *heads*, (C) or anterior rounded articular surfaces for the phalanges ; the middle part is the body, (B) which is sharp above and broad beneath.





Under Surface.

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* See page 61.

The *first* (I) has an articular surface on its base (1) for the inner cuneiform bone, and one on the outside for the second metatarsal.

The *second* (II) has on its base an articular surface for the middle cuneiform (1), two on the inner side, the hindmost (2) for the inner cuneiform, the foremost for the first metatarsal; and two on the outside, both of which receive part of the outer cuneiform (3) and the third metatarsal.

The *third* (III) has one on its base (1) for the outer cuneiform, two on the inside for the second metatarsal, and a large one on the outside for the fourth metatarsal.

The *fourth* (IV) has one on its base (1) for the cuboid, two on its inside, the hind one (2) for the outer cuneiform, and the other for the third metatarsal, and one on its outside for the fifth.

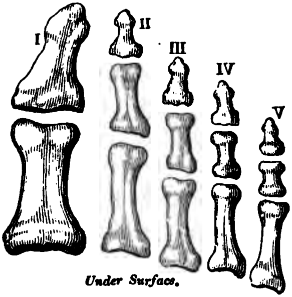
The *fifth* (V) has one on the base (1) for the cuboid, and one on the inner side for the fourth metatarsal. It is also remarkable for a tuberosity (2) on its outer part which projects very much, gives attachment to a strong ligament which supports the arch of the tarsus on the outside, and marks its junction with the os cuboides, which is immediately behind it.

The Connection of the metatarsal bones has been given in their description.

The *muscles* attached to them are fourteen; viz. the M. interossei (seven) & transversalis pedis, common to all; to the first metatarsal are attached M. tibialis anticus & peroneus longus; to the second, M. adductor pollicis pedis; and to the fifth, M. peroneus brevis, abductor & *flexor brevis minimi* digiti.

THE TOES. *Phalanges Digitorum Pedis.* (C.)

Situation. Before the metatarsus.



Under Surface.

Description. They consist of fourteen bones,* of which there are but two rows to the great toe, *pollex pedis*, and three to the other toes; their division is similar to that of the fingers, into base, body, and head, but they are much shorter and flatter.

The *muscles* attached to them are nineteen; viz. *above*, M. extensor proprius pollicis & extensor longus & brevis digitorum pedis, interossei (seven); *below*, M. flexor longus & brevis & abductor pollicis, flexor longus & brevis digitorum & lumbricales (four).

SESAMOID BONES. *Ossa Sesamoidea*

Of these there are two at the base of the first phalanx of the great toe, giving insertion to the M. flexor brevis & abductor pollicis pedis.

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* See page 61.

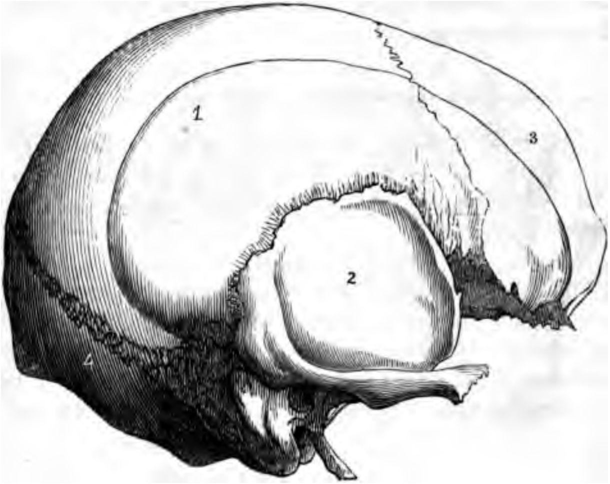
CHAP. V.

Of the Head.

THE bones of the Head, *caput*, are twenty-two in number, exclusive of the auditory bones and teeth, which are forty in addition. They are usually divided into those of the SKULL, *cranium*, and FACE, *facies;* some of them are in pairs, but others are only single bones.

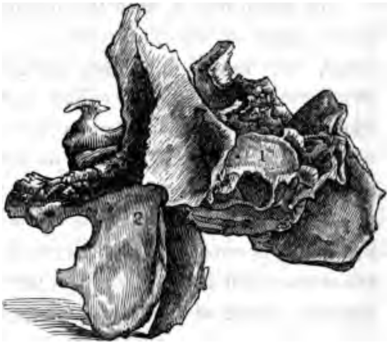
To the Skull there are two pairs and two single bones; viz.

2 Ossa parietalia (1).
2 —— temporum (2).
1 Os frontis (3).
1 — occipitis (4).



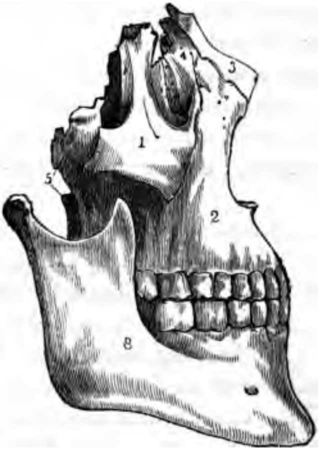
To the Skull and Face two single bones are common; viz.

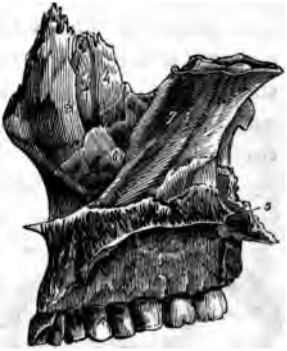
1 Os ethmöides (1).
1 — sphenöides (2).



To the Face there are six pairs and two single bones; viz.

2 Ossa malarum (1).
2 — maxillaria superiora (2).
2 Ossa nasi (3).
2 —— lachrymalia (4).
2 Ossa palatina (5).
2 —— turbinata (6).
1 Vomer (7).
1 Os maxillare inferius (8).





All these bones, with the exception of the ossa temporum and os maxillare inferius, which form a ginglymoid, or hinge joint, are united by that species of SYNARTHROSIS, which is called SUTURE, from its resemblance to the stitches of a seam. And here would seem to be the proper place to describe the sutures, but as they cannot be well explained, till the processes of the different bones of the head have been spoken of, it has been deemed best to defer the description of them till the student has obtained a perfect knowledge of the separate bones of the skull and face.

THE BONES OF THE SKULL,

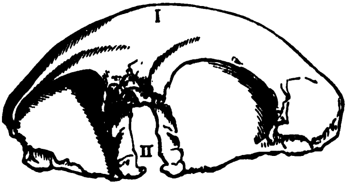
Strictly so called, have been before mentioned as two pairs and two single bones.

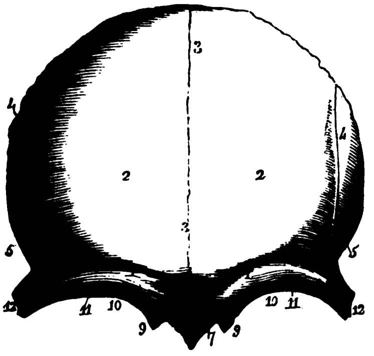
FRONTAL BONE. *Os Frontis* (1).

Situation. In the anterior superior part of the skull, forming the forehead and part of the temples above, and to the sides; and the roof of the orbits below.

Description. The os frontis nearly resembles in shape a clam shell: it is convex and regular before, concave and slightly irregular behind: convex from before backwards, and from side to side above; and irregularly concave below.

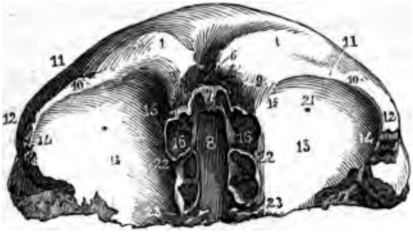
On the *External Surface*, it is naturally divided into two portions by the superciliary ridges, *arcus superciliares*, situated at the most anterior inferior part of the bone; that which is above the ridges is called the *fronto-temporal portion* (I); and that behind them, the *ethmoido-orbital* portion (II).



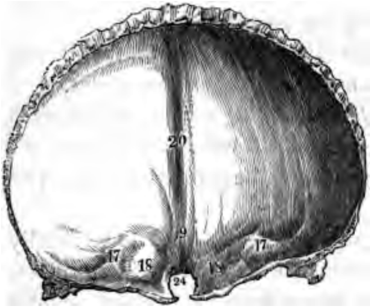


In the Fronto-Temporal Portion are found, immediately above the superciliary ridges, the two frontal prominences, *protuberantiæ frontales* (1, 1), just above the inner corners of the orbits, and marking the situation of the frontal sinuses, *sinus frontales* : about an inch above them, and rather to their outer side, are two other projections (2, 2) which mark the beginning of ossification: extending upwards and backwards from the lowest part of the bone, in the mesial line is seen a slight ridge (3, 3) more or less projecting, marking the place at which the bone was divided into two portions in the young subject, and also part of the course of the longitudinal sinus of the dura mater within the skull : the sides of this portion, forming the temples, are separated from the forehead by the temporal arches, *arcus temporales* (4, 4,) which at first are very strongly marked below, and become less distinct as they pass upwards and backwards ; the hollows below form parts of the temporal pits, *fossæ temporales* (5, 5,) in which the M. temporales rest. The posterior edge of the fronto-temporal portion is deeply serrated as far as the temporal arches, and bevelled from above downwards and forwards ; whilst that below them is squamous, and slightly serrated downwards and backwards.

In the Ethmoido-Orbital Portion are found,



In the middle, the nasal process, *processus nasalis* (6), deeply denticulated, and springing out from it, is the nasal spine, *spina nasalis* (7); behind which is the ethmoidal notch, *incisura ethmoidalis* (8); at the outer edges of the nasal process are the two internal angular processes, *processus angulares interni* (9, 9), and rising up from them, the superciliary ridges, *arcus superciliares* (10, 10) with a notch or hole, the supra-orbitar hole, *foramen supra-orbitare*, (11, 11) in each: as the ridges pass upwards, outwards, and downwards, to terminate in the external angular processes, *processus angulares externi* (12, 12), the bone appears pinched up, which, together with the hollows of the temporal pits behind, render the external more distinct than the internal angular processes; behind and between the angular processes are the two orbitar plates, *lamellæ orbitares* (13, 13) of a triangular shape, the bases in front, the apices behind, and truncated; the orbitar plates are concave from side to side, and deepest close by the external angular processes, forming a cavity for the lacrymal gland, called lacrymal pit, *fossa lacrymalis* (14, 14); behind the internal angular process is a depression or a spine, sometimes one, sometimes the other, to give attachment to the pulley of the superior oblique muscle of the eye; when a spine, it is called *spina trochlearis* (15, 15); between the orbitar plates and the edges of the ethmoidal notch are *found the openings* of the frontal sinuses (16, 16).



On the *Internal Surface* are found, in the FRONTO-TEMPORAL PORTION, numerous slight eminences, and broad shallow depressions, produced by the convolutions of the cerebrum, and called, from their form, mamillary eminences, *eminentiæ mamillares* (17), and finger-like impressions, *impressiones digitatæ* (18); from the middle of the anterior part of the ethmoidal notch, the internal spine, *crista interna* (19), commences, which gives attachment to the dura mater, and projecting sharply backwards, extends upwards about an inch, and divides into two ridges, with a small cavity between them, continued up to the posterior edge of the bone, and called frontal furrow, *sulcus frontalis* (20), in which part of the longitudinal sinus is lodged: it is said, that when the frontal bone remains divided in the adult, there is no spine. Immediately behind the commencement of the frontal spine is the *foramen cæcum* (21). On either side of the spine is a concavity, which receives the anterior lobes of the cerebrum, and answers to the prominences marking the commencement of ossification. The upper part of the ETHMOIDO-ORBITAL PORTION supports the anterior lobes of the cerebrum, and is marked by eminentiæ mamillares and impressiones digitatæ.

THE FORAMINA in the os frontis are five perfect and six imperfect. The five *perfect* are,

1. *Foramen cæcum* (21), situated in the inside of the

bone at the root of the spine, giving attachment to the dura mater, and allowing the passage of a vein.

2 & 3. The *openings* (16, 16) of the frontal sinuses, between the ethmoidal notch and the orbitar plates.

4 & 5. *Foramina frontalia* (22, 22) one behind each internal angular process, through which a branch of the supra-orbitary nerve passes into the frontal sinuses. The six *imperfect* are,

1 & 2. *Foramina supra-orbitaria* (11, 11), usually completed by ligament, situated in the superciliary ridges, about one-third of their length from the internal angular processes, for the passages of the supra-orbitary nerve, artery, and vein.

3 & 4. *Foramina orbitaria interna anteriora* (23, 23), placed about half an inch behind the lowest edge of the nasal process in each orbitar plate, and giving passage to the ethmoidal branch of the supra-orbitary nerve and artery, into the ethmoidal cells and skull.

5 & 6. *Foramina orbitaria interna posteriora* (24, 24), about half an inch behind the anterior, for the passage of the branch of an artery. The four last foramina are completed by the ethmoid bone.

Junction. The os frontis is joined above and behind with the ossa parietalia, which junction terminates at a line running horizontally backwards from the point of the outer angular process; between those two points, and behind as far as the ethmoidal notch, it joins with the sphenoid bone on each side: within the ethmoidal notch it receives the ethmoid bone which joins to the orbitar plates, at the anterior part of which it unites with the os *lacrymale; before it* joins by its nasal process and spine *with the ossa nasi,* ossa maxillaria superiora, and ethmoid bone, and by its outer angular processes with the malar bones.

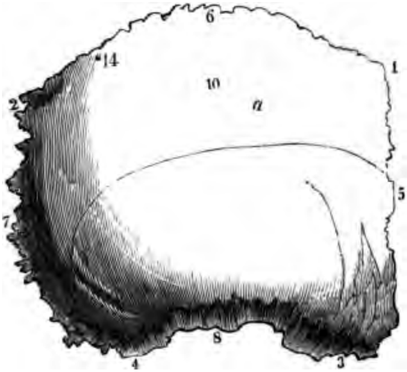
The *muscles* attached to the os frontis are three pairs; viz. M. temporalis, corrugator supercilii, & orbicularis palpebrarum, and it is also covered by M. occipito frontalis.

PARIETAL BONES. *Ossa Parietalia* (2).

A pair.

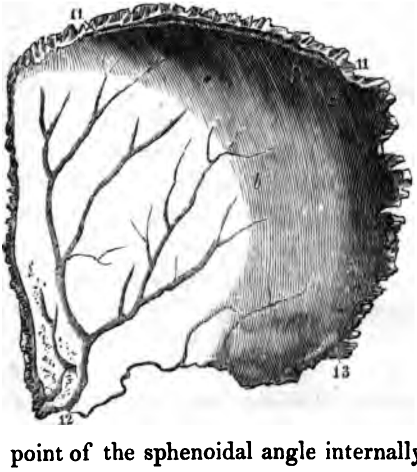
Situation. At the superior and lateral parts of the skull, forming the vertex or top of the head, and parts of the temples.

Description. Externally (*a*) convex and smooth from before to behind, but rather flat anteriorly, convex from side to side: internally (*b*) concave from before backwards, and from side to side, and marked by the convolutions of the cerebrum. It is divided into four angles and four edges; the anterior superior, the frontal angle, *angulus frontalis* (1), sharp; the posterior superior, the occipital angle, *angulus occipitalis,* (2), also sharp; the anterior inferior, the sphenoidal angle *angulus sphenoidalis* (3), truncated; the posterior inferior, the temporal angle, *angulus temporalis* (4), also truncated: *the* anterior edge is called the frontal edge, margo *frontalis* (5); the superior, the parietal edge, margo pa



rietalis (6); the posterior, the occipital edge, *margo occipitalis* (7); all three of which are deeply serrated; and the inferior is the temporo-sphenoidal edge, *margo temporo-sphenoidalis* (8), the posterior part of which is slightly serrated, and the rest of it is squamous; this edge is of a semicircular form, whilst the other three are nearly straight. About two inches above the lower edge, the temporal arch (9) extends backwards from the os frontis in a semicircular direction along this bone, and terminates at the anterior point of its temporal angle. There is usually a mark in the centre of the bone, pointing out the beginning of ossification (10).

On the internal surface of the bone, running along the upper edge, is part of a groove for the longitudinal sinus (11), which is completed when both bones are united; and frequently to the outer edge of this, several little pits giving lodgement to the glandulæ pacchioniæ. In the anterior point of the sphenoidal angle internally is a groove (12) sometimes a complete canal for the middle artery of the dura mater, which passes upwards and marks the *bone with its* ramifications: on the posterior point *of the temporal* angle internally there is a broad groove *(13), for part of* the lateral sinus.



Foramen. Only one, *foramen parietale* (14), near the upper edge, for the passage of a vein to the longitudinal sinus.

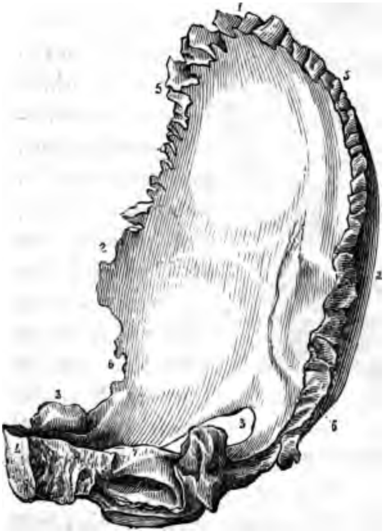
The only *muscle* attached to it is the M. temporalis; the M. occipito frontalis passes over it.

Junctions. By its frontal edge, with the os frontis; by its parietal edge, with its fellow; by its occipital edge, with the os occipitis; and by its temporo-sphenoidal edge, with the temporal bone behind, and the sphenoid bone before.

OCCIPITAL BONE. *Os Occipitis.*

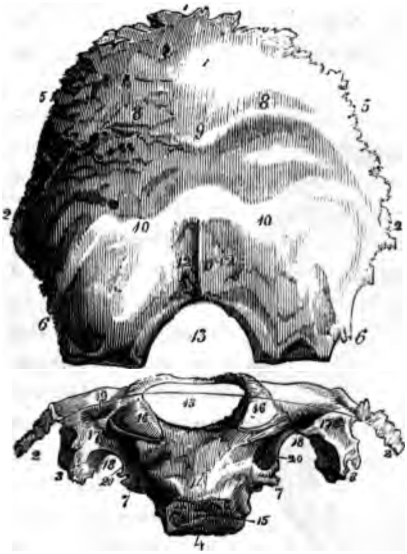
Situation. In the posterior and under part of the skull, forming the occiput or hind-head, and part of the base of the skull.

Description. Convex behind (*a*), concave before (*b*); of an irregular hexagonal figure, the long axis being from above to below: the superior angle sharp, the occipital angle, *angulus occipitalis* (1), the two superior lateral angles obtuse, the parietal angles, *anguli parietales* (2, 2); the two inferior angles obtuse, the temporal angles, anguli temporales (3, 3), and

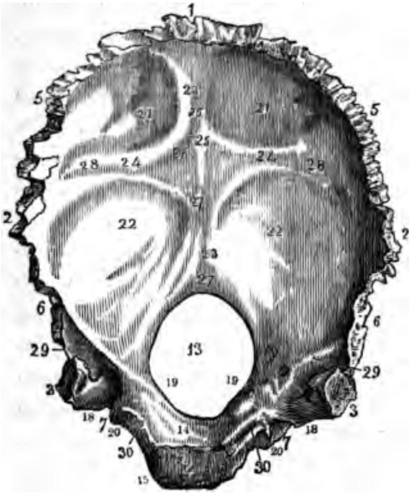


the anterior inferior angle truncated, the sphenoidal angle, *angulus sphenoidalis* (4). The two superior edges, between the occipital and parietal angles, rather convex and serrated; the parietal edges, *margines parietales* (5, 5), the two lateral edges between the parietal and temporal angles, concave and deeply denticulated; the temporal edges, *margines temporales* (6, 6); the two anterior edges, between the temporal and sphenoidal angles, also concave, and irregularly plane; the basilar edges, *margines basilares* (7, 7).

The *External Surface* (*a*) is smooth above a horizontally curved line which is called the superior transverse arch, *arcus transversus superior* (8, 8); in the middle of which is the external occipital protuberance, *protuberantia occipitalis externa* (9); and to these are attached *above* the M. occipito frontales, and *below* on each side the M. trapezii & complexi; about an inch below is the inferior transverse arch, *arcus transversus inferior* (10, 10), to which is attached the M. splenii, recti postici majores, and obliqui superiores capitis; from



the external occipital protuberance passes down perpendicularly, the occipital spine, *spina occipitalis* (11), dividing the posterior inferior part of the bone into two parts; and on each side of it, below the inferior transverse arch, are the occipital pits, *sulci occipitales* (12, 12), into which the M. recti postici minores capitis are inserted. The under and fore part of the bone then bifurcates, and diverging, forms the posterior part of the great hole, *foramen magnum* (13); it then converges, forms the fore part of the same foramen, and sends out a strong process anteriorly, the basilar process, *processus basilaris* (14), which terminates in the anterior angle, and that being truncated and rough, forms the sphenoidal process, *processus sphenoidalis* (15); on the anterior lateral edges of the foramen magnum are situated the condyloid processes, *processus condyloides* (16, 16), which are of an irregular oval shape, with their axes from before to behind, and facing downwards, outwards, and backwards, so that their anterior and inner edge is the deepest; they are convex from before to behind, slightly convex from side to side; and by them the head articulates with the first cervical vertebra: extending from the condyloid processes laterally outwards and rather backwards to terminate at the temporal angles, is a ridge on each side (17, 17) which gives attachment to the M. rectus lateralis capitis, and before them in the basilar edges, the bone is scooped out on each side to form part of the *foramina lacera basis cranii posteriora* (18, 18); behind the condyloid processes are the *foramina condyloidea posteriora* (19, 19), and before them the *foramina condyloidea anteriora* (20, 20).



The *Internal Surface* of the Bone is divided behind the foramen magnum into four cavities (21, 22) by the crucial ridge, the perpendicular portion of which is called the internal spine, ***spina interna*** (23, 23), and the transverse, the transverse spine, ***spina transversa*** (24, 24); and where they intersect is the internal occipital protuberance, *protuberantia occipitalis interna* (25): the internal spine *above* the transverse spine has usually a deep groove on its right side (26) for the longitudinal sinus, and *below* it a narrow groove (27) for the occipital sinus; the transverse spine is more or less hollowed on one or both sides (28, 28) for the lateral sinuses. To the spine, above the transverse spine, is attached the falx major of the dura mater, and to the same part below, the falx minor is connected; to the transverse spine the posterior edge of the tentorium is fixed. The cavities above the transverse spine (21, 21) are for the posterior lobes of the cerebrum, and those below (22, 22) for the cerebellum, and at their anterior extremities are more or less of the terminations of the grooves (29, 29) for the lateral sinuses in the foramina lacera, with the posterior condyloid foramina opening into each of them. The upper surface of the basilar process (14) is seen hollowed out, broad below, and narrow above, to receive the medulla oblongata; and on its superior edges are seen parts of the *grooves* (30, 30) for the inferior petrosal sinuses.

THE FORAMINA in the os occipitis are five perfect and two imperfect. The five *perfect* are,

1. *Foramen magnum* (13), rather of an oval figure, with the long axis from before to behind, through which pass *out* of the skull the medulla oblongata, and the anterior arteries of the medulla spinalis, and *into* it the vertebral arteries and accessory nerves.

2 & 3. *Foramina condyloidea anteriora* (20, 20), situated within the lateral edges of the foramen magnum, through which the lingual nerves pass.

4 & 5. *Foramina condyloidea posteriora* (19, 19), by which veins from the back part of the neck enter into the lateral sinuses. The two *imperfect* are,

1 & 2. *Foramina lacera basis cranii posteriora* (18, 18), completed by the temporal bone, through which pass the glossopharyngeal, pneumo-gastric, and accessory nerves from the skull, and at which the lateral sinus joins with the internal jugular vein.

Junctions. The os occipitis is joined by its parietal edges to the parietal bones: by its temporal edges to the mamillary portions of the temporal bones; by its basilar edges to the petrous portions of the same bone; and by its sphenoidal process to the sphenoid bone.

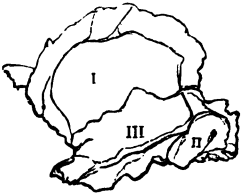
The *muscles* attached to the os occipitis are eleven pairs; viz. the M. trapezii, complexi, splenii, recti postici majores, & minores capitis, obliqui superiores capitis, recti laterales, recti interni majores, & minores capitis, constrictores pharyngis superiores, & occipito-frontales.

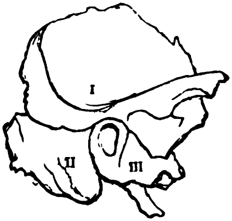
TEMPORAL BONES. *Ossa Temporum* (2).

A pair.

Situation. In the inferior, middle, and lateral parts of the skull, forming parts of the temples and cheeks.

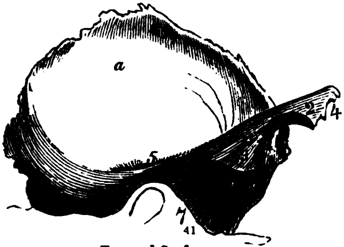
Description. It is of an irregular shape, thin before and above, and thick behind and below, sending from within a strong triangular process, which passes forwards, inwards, and downwards, and being of a close texture and rocky hardness, is called the *pars petrosa* (III); it naturally divides the other part of the bone into two; that which is before, and to the outer side of it, is called *pars squamosa* (I), from its being thin like a fish-scale; and that which is behind, and to its outer side, the *pars mamillaris* (II), from its resemblance to a nipple.



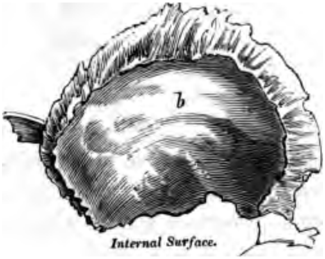


The Pars Squamosa (I),

Is situated in front; it is bounded below by the meatus auditorius externus, which is the largest external hole, and above by the petrous portion.



External Surface.



Internal Surface.

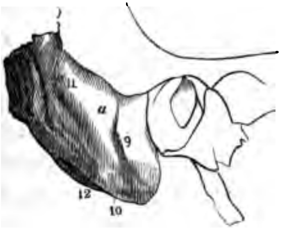
The superior part of the pars squamosa is very thin, and called the scaly plate, *lamella squamosa* (1): it forms externally (*a*) part of the temporal fossa, from the under and outer part of which extends the root of the zygomatic process, *processus zygomaticus* (2), which is thin and narrow, facing downwards and inwards, it passes forwards, curves slightly inwards, is smooth above, but irregular, and having a tubercle (3) at its root below, and terminates in a denticulated process, the malar process, *processus malaris* (4); between the root of the zygomatic process above, and the scaly plate, is the temporal pulley, *trochlea temporalis* (5), over which the M. temporalis plays; behind the root of the same process below is the glenoid cavity, *cavitas articularis* (6), for the articulation of the lower jaw, bounded behind by the glasserian fissure, *fissura glasseri* (7), and before by the articular eminence, *eminentia articularis* (8), broadest within, and narrowest without, where it terminates in the tubercle of the zygomatic process.

Within (*b*), the squamous part is marked by the convolutions of the middle lobes of the cerebrum, and the edge bevelled off, where it joins with the parietal bone.

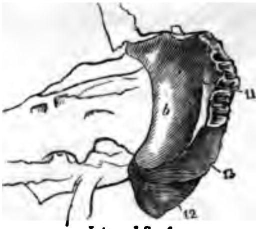
The Pars Mamillaris (II),

Situated at the posterior inferior part of the bone, bounded before and above by the pars petrosa, and below by the auditory process.

It forms an irregular semicircular ridge above, to join with the parietal bone, and behind is deeply denticulated to join with the occipital bone. At the under part, externally (*a*), it is shaped like a nipple, and called, at that part, mastoid process, *processus mastoideus* (9), upon which is a small groove (10) for the occipital artery, and above it usually is seen the mastoid hole, *foramen mastoideum* (11); behind the mastoid process is a deep pit, the digastric pit, *fossa digastrica* (12), from which the M. digastricus arises.



External Surface.

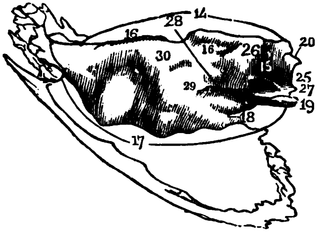


Internal Surface.

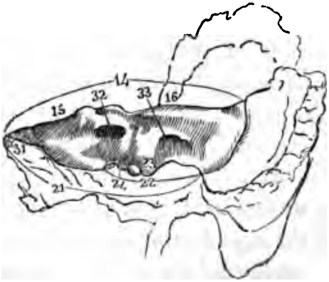
On the inside (*b*) of this part, the mastoid process is deeply hollowed, to receive the termination of the lateral sinus (13); and between it and the squamous part, the substance of the bone is cellular, forming the mastoid cells, *cellulæ mastoideæ*, which are not seen but by making a section of the bone.

The Pars Petrosa (III),

Situated on the inside of the bone, passing forwards, inwards, and downwards from the junction of the squamous with the mamillary portions, is of a triangular shape with the base below.

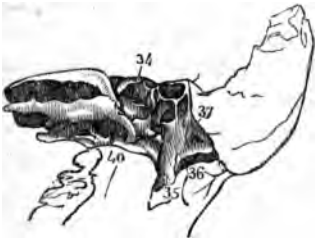


Anterior face.



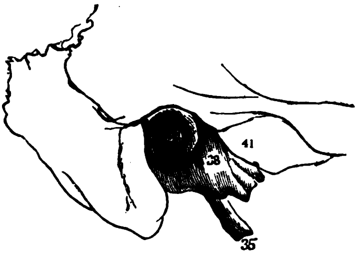
Posterior face.

It has three angles and three faces. The *superior angle* (14) has a broad shallow depression (15) near its inner point, over which the trigeminal nerve passes; and, extending along from thence to the upper part of the pit in the mastoid process, is a groove (16), for the superior petrosal sinus. In the *anterior inferior angle* (17) is the bony part of the Eustachian tube, *tuba eustachiana* (18); and above it, part of the carotid canal (19); the extreme inner point (20) is rough, to join with the root of the posterior clinoid process of the sphenoid bone. The *posterior inferior angle* (21) is very irregular; it has a deep notch in it, which forms part of the posterior lacerated hole at the base of the skull, *foramen lacerum basis cranii posterius* (22), divided into two by a jutting process, jugular process, *processus jugularis* (23), which separates the nerves passing through this hole from the jugular vein: in the inner notch, the aqueduct of the cochlea, *aquæductus cochleæ* (24), opens, presenting a conical cavity with its base facing backwards and downwards. In the ***anterior face*** is seen to the inner point a slight notch (25), forming part of the carotid hole, to the outer side of which is the continuation of the groove (26) for the trigeminal nerve; and below it, part of the anterior lacerated hole at the base of the skull, *foramen lacerum basis cranii anterius* (27), which, before maceration, is filled up by a ligamentous structure, and forms part of the carotid canal: extending outwards and upwards from this is the unnamed canal, *canalis innominatus* (28), which terminates in the unnamed hole, *foramen innominatum* (29); and still further out is seen the projection of the vertical semicircular canal (30). In the *posterior face* are, at the extreme inner part, a portion of the *groove* (31) for lodging the inferior petrosal sinus, the remainder of it being situated on the basilar process of the os occipitis; to the outer side of this is seen the internal auditory hole, *foramen auditivum internum* (32), leading to the internal auditory passage, *meatus auditorius internus*, and still further out, the opening of the aqueduct of the vestibule, *aquæductus vestibuli* (33), covered by a scale of bone. In the *inferior face* or *base* is the jugular pit, *fossa jugularis* (34), in shape like a thimble, for the termination of the jugular vein immediately before the notch of the foramen lacerum posterius; on the outer side of the pit is seen the styloid process, *processus styliformis* (35), from which arise three muscles and two



Inferior face.

ligaments; it is surrounded by its vaginal process or sheath, *processus vaginalis* (36), from which it may be drawn out; between the root of the styloid process and the fore part of the digastric pit is the stylo-mastoid hole, *foramen stylo-mastoideum* (37), the external opening of the canal of that name, which passes through the top of the tympanum, but cannot be seen till a section of the bone be made: in front of the styloid process and the jugular pit is seen the auditory process, *processus auditivus* (38), which forms the floor of the external auditory passage, *meatus auditorius externus;* the auditory process is slightly hollowed to receive part of the parotid gland, and has above it the external auditory hole, *foramen auditivum externum* (39); and behind its inner point the external opening of the carotid canal (40). The posterior and inner part of this face is truncated obliquely and irregularly upwards.



External surface.

THE FORAMINA in this bone are ten whole and three imperfect. The ten *perfect* are,

1. *Foramen glenoideum* (41) in the fissura glasseri, for the passage of the Nervus chorda tympani from the tympanum, and the M. externus mallei into it.

2. *Foramen auditivum externum* (39), between the auditory and the mastoid process to which the auricle of the ear is attached, and which is the beginning of the bony part of the external auditory passage.

3. *Foramen stylo-mastoideum* (37), between the mastoid and styloid processes for the passage of the facial nerve from the stylo-mastoid canal.

4. *Foramen mastoideum* (11), generally behind and above the mastoid process, but sometimes found between the temporal and occipital bones, and at other times though rarely, entirely in the latter bone; it transmits a vein from the integuments of the skull to the lateral sinus.

5. *The opening* (24) of the aquæductus cochleæ.

6. Ditto (40) carotid canal.

7. Ditto (18) Eustachian tube.

8. *Foramen innominatum* (29), in the anterior face of the pars petrosa, for the passage of the nervus innominatus to the beginning of the stylo-mastoid canal, to join with the facial nerve.

9. *Foramen auditivum internum* (32), by which the facial and auditory nerves enter the meatus auditorius internus.

10. The *opening* (33) of the aquæductus vestibuli. The two last holes are in the posterior face of the pars petrosa. The *imperfect* foramina are,

1. *Foramen lacerum basis cranii anterius* (27) filled in the recent state by ligament, forming part of the carotid canal.

2. *Foramen caroticum* (25) for the passage of the internal carotid artery in the skull.

3. *Foramen lacerum basis cranii posterius* (22) for the passage of the glossopharyngeal, pneumo-gastric, and accessory nerves, and the junction of the jugular vein with the lateral sinus.

Junctions. The os temporis is joined by its malar process to the zygomatic process of the os malæ; by the inferior edge of the pars squamosa to the spinous process of the os sphenoides; by the superior edge of the same part to the temporo-sphenoidal edge of the os parietale, by the superior edge of the pars mamillaris to the temporal angle of that bone; by the inferior edge of the pars mamillaris, and by the posterior inferior angle of the pars petrosa to the temporal and basilar edges of the os occipitis; and by the inner point of the pars petrosa to the root of the posterior clinoid process of the os sphenoides.

The *muscles* attached to the os temporis are nineteen; viz. M. temporalis, masseter, retrahentes aurem (two), occipito-frontalis, sterno-mastoideus, trachelo-mastoideus, splenius, digastricus, tensor & levator palati, stylo-hyoideus, stylo-glossus, stylo-pharyngeus, & constrictor pharyngis superior; and the muscles moving the small bones of the ear, M. tensor tympani, laxator tympani, externus mallei, & stapedius.

The os temporis contains, besides the parts which have been described, the organ of hearing,* including the ossicula auditus, viz. malleus, incus, os orbiculare, and stapes. As, however, these cannot be understood, till sections of the os temporis have been made, it will be better to defer the whole, rather than to describe the organ of hearing partially in this place.

ETHMOID BONE. *Os Ethmoides.* (1).

Situation. In the ethmoidal notch of the os frontis, and forming the roof of the nostrils.

Description. The ethmoid bone derives its name from its resemblance to a sieve, being full of holes; it is of a cuboidal figure, and made up principally of cells.

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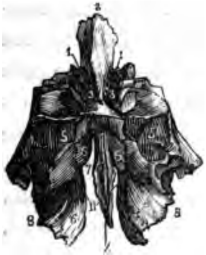
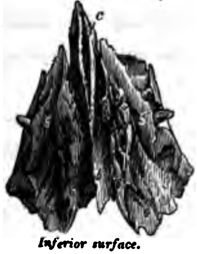
* See chap. viii. sect. 4.

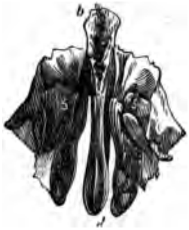
The superior surface of the bone is called its cribriform plate, *lamella cribriformis* (1, 1), which has in the middle the cock's comb, *crista galli* (2), to which the beginning of the falx major of the dura mater is attached; it is thin and narrow at the back part of the cribriform plate, but as it advances it becomes deeper and broader, where it is sometimes hollowed to form part of the foramen cæcum; on each side of the cock's comb are numerous little holes, the sieve-like holes, *foramina cribrosa* (3, 3); from the under part of the crest descends the nasal plate, *lamella nasalis* (4), thick behind, and above (*a*) where it joins with the ethmoidal process of the sphenoid bone, thin behind and below (*b*), where it joins with the vomer, very much thicker before and above (*c*), directly under the crista galli, where it joins with the crista nasalis of the frontal bone, and thick below and before (*d*), where it joins with the septal cartilage of the nose; on either side of the nasal plate, which forms a division between them, are the convolutions of the bone, which coalescing form the ethmoidal sinuses, *sinus ethmoidales* (5, 5), anterior and posterior, the former



Superior & posterior surfaces.

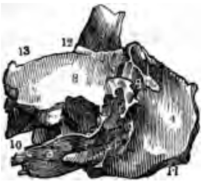


Inferior surface.



Anterior surface.

(11, 11) terminating in the middle, and the latter (10, 10) in the superior chambers of the nose; two of these long convolutions, which are nearest to the nasal plate, descend further, are more distinct, have their concavities outwards, and are called turbinated plates, *lamellæ turbinatæ* (6, 6); the spaces between the turbinated plates below, and the under part of the cribriform plate above, are called the superior chambers of the nose, *meatus superiores nasales* (7, 7); the spaces below them, and to their outer surfaces, form part of the middle chambers of the nose, *meatus medii nasales:* the ethmoidal sinuses are bounded externally for the most part by the flat plates, *lamellæ planæ* (8, 8), which form the principal portions of the inside of the orbits, but at the anterior part (9), where the frontal and ethmoidal sinuses send their canals to terminate in the middle chamber, they are covered by the ossa lacrymalia.



Lateral surface.

The Foramina in this bone are, numerous perfect, and three imperfect pairs. The *perfect* are

Foramina cribrosa (3, 3), through which the olfactory and ethmoidal nerves pass to the nose.

The *openings* (10, 10) of the posterior ethmoidal sinuses. The *imperfect* foramina are

1. The *openings* (11, 11) of the anterior ethmoidal sinuses.

2 & 3. *Foramina orbitaria interna anteriora* (12, 12) *& posteriora* (13, 13), in the upper edge of the flat plate completed by the os frontis, through the anterior of which the ethmoidal nerve passes up into the skull, and through the posterior an artery and vein to the ethmoidal sinuses.

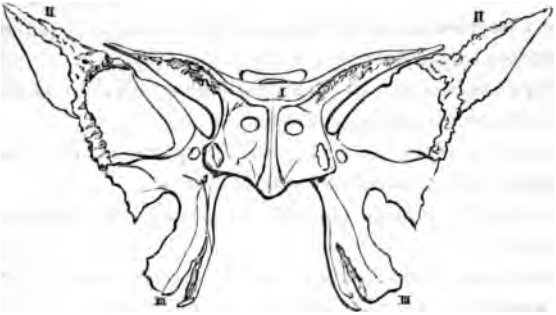
Junctions. The os ethmoides is joined above by the edges of its cribriform plate to the edges of the ethmoidal notch of the os frontis, and to the os sphenoides; and by the posterior part of its nasal plate to the latter bone and to the vomer; by the fore part of the same plate to the back part of the nasal crest of the os frontis; by the anterior edge of its flat plate with the os lacrymale; and by the lower edge of the same plate with the superior maxillary bone and palate bone.

There are *not any muscles* attached to or covering this bone.

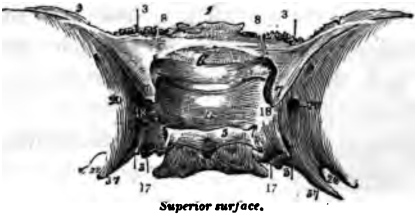
SPHENOID BONE. *Os Sphenoides.* (2).

Situation. In the middle of the skull, immediately behind the bones of the face.

Description. This bone is called sphenoid or wedge bone, because it seems to wedge and lock together all the other bones of the skull. It is divided into the body, *corpus* (I), *two* temporal portions, *partes temporales* (II, II), *and two* pterygoid portions, *partes pterygoideæ* (III, III).

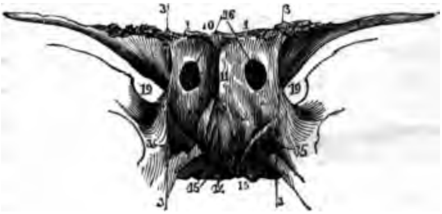


THE BODY (1),



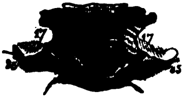
Superior surface.

Is situated in the middle of the bone, and may be said to resemble an oblong square box, with its long axis from before to behind; it is bounded before by its nasal surface, *facies nasalis* (1), behind by its occipital surface, *facies occipitalis* (2), and laterally by a perpendicular line, raised from the processus pterygoidei (3, 3), the most depending part of the bone. On the middle of the upper part of the body is the Turkish saddle, *sella turcica* (4) concave from before to behind, and in it rests the pituitary gland of the brain; the sella turcica is bounded behind by a broad process, the posterior clinoid process, *processus clinoides posterior* (5), so called from its supposed resemblance to the knob of a bedstead; it is, however, nearly flat above, with a trifling cavity from side to side; it is bounded before by the olive-shaped process, *processus olivaris,* (6), which is usually hollowed, and upon it the optic nerves decussate, or at least join: on each side of this process, and extending back over the sella turcica are the anterior clinoid processes, *processus clinoides anteriores* (7, 7), two in number, having in their roots the optic holes, *foramina optica* (8, 8): sometimes the anterior and posterior clinoid processes are united by a slip of bone running from one to the other; at other times, a little bony process is sent down from the anterior clinoid *processes to the* outer edges of the processus olivaris, so



Inferior surface.

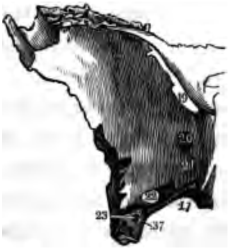
that the transverse artery of the brain passes through complete foramina; extending forwards and outwards from the anterior clinoid processes, and terminating in points as they pass out, are the transverse spinous processes, *processus transverso-spinosi* (9, 9), which are thin and triangular, their bases attached to the body of the bone, and their points extending outwards: in front of the body is the ethmoidal spine, *spina ethmoidalis* (10); below and before which is the ethmoidal process, *processus ethmoidalis* (11); the body contains the two sphenoidal sinuses, *sinus sphenoidales* (12, 12), divided by a plate of bone (13), and opening into the superior chamber of the nose; on its under surface is the single process, *processus azygos* (14), on either side of which are the parts called by some anatomists the triangular bones, *ossa triangularia* (15, 15), and described by them as distinct bones; they merely form the floor of the sinuses and the roof of the spheno-palatine holes, *foramina spheno-palatina*, by which the spheno-palatine nerves pass into the nose: the occipital surface of the bone faces rather downwards and is rough, forming the basilar process, *processus basilaris* (16); on each side of which is a deep notch, forming part of the foramen caroticum (17, 17): on each side of the body is a groove for the internal carotid *artery (18, 18).*



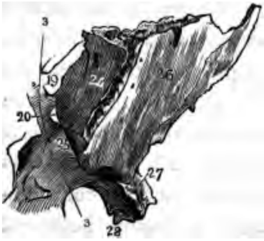
Posterior surface.

The Temporal Portions (ii, ii),

Are placed to the outer sides of the imaginary lines above described; they pass first outwards, and afterwards upwards laterally, and forwards: they are hollowed within, and form, with the squamous and petrous portions of the temporal bones, the cavities for lodging the middle lobes of the cerebrum; whilst the anterior ascending part separates the general cavity of the skull from the orbits. Internally between the anterior inner edge of the temporal portion and the transverse spinous process, is situated the superior lacerated orbitar hole, *foramen lacerum orbitare superius* (19, 19), of an irregular shape, largest below and to the inside, and becoming pointed as it extends outwards; behind and below it is the round hole, *foramen rotundum* (20, 20); extending backwards from which is a *groove* (21, 21) for the lodgement of the superior maxillary nerve; more backwards, and to the outer side, is the oval hole, *foramen ovale* (22, 22), and behind it, in the extreme angle, is the spinous hole, *foramen spinosum* (23, 23). The anterior upraised surface of the pars temporalis forms the orbitar plate, *lamella orbitaris* (24, 24), facing upwards and inwards, forming the back and outer part of the orbit; it is of a triangular shape, with the base forwards



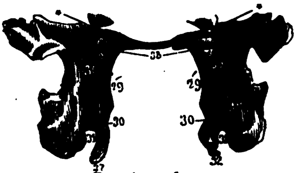
Anterior & external surfaces.



Superior surface.

and outwards; its lower edge (25) forms the upper margin of the inferior lacerated orbitar hole, or spheno-maxillary fissure, *foramen lacerum orbitare inferius.* The outer surface, joining at an obtuse angle with the orbitar plate, is the temporal plate, *lamella temporalis* (26, 26), which forms part of the fossa temporalis; extending back from the temporal fossa is the spinous process, *processus spinosus* (27, 27), which passing backwards, dips down, and forms a little process, the styloid process, *processus styliformis* (28, 28).

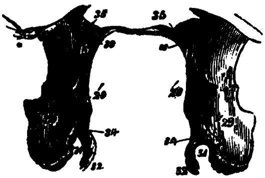
THE PTERYGOID PORTIONS (III, III):



Posterior surface.

Are situated at the under part, on either side of the body of the bone, extending downwards from its junction with the temporal portions; they bound above, and to the sides, the posterior openings of the nostrils. Each pars pterygoidea is divided into two plates, *laminæ* (29, 29'), having posteriorly, between each two, the pterygoid pits, *fossæ pterygoideæ* (30,30), which, as the laminæ pass down and separate, terminate in the pterygo-palatine fissures, *fissuræ pterygo-palatinæ* (31, 31), the nasal plate, *lamina nasalis* (29', 29'), is the longest, it faces slightly outwards, and terminates in a little curved process, the hook-like process, *processus hamularis* (32, 32), over which the tendon of the M. tensor palati plays: the outer plate is the muscular plate, *lamina muscularis* (29, 29), which is the broadest and strongest, but shortest; it faces considerably outwards and forwards, and is deeply hollowed behind. On the upper and fore part is seen the beginning of the pterygo-palatine canal, *canalis pterygo-*

palatinus (33, 33), by which the palatine nerve passes into the mouth; the anterior surfaces of both laminæ are roughly marked (34, 34) where they join with the palate, and superior maxillary bones.



Anterior surface.

THE FORAMINA in the os sphenoides are seven pairs perfect and four imperfect. The *perfect* foramina are,

1. *Foramina optica* (8, 8), for the passage of the optic nerves and ocular arteries from the skull.

2. *Foramina lacera orbitaria superiora* (19, 19), for the passage of the common oculo-muscular, inner oculo-muscular, ophthalmic branch of the trigeminal, and the outer oculo-muscular nerves *from* the skull, and of the ocular veins *into* it.

3. *Foramina rotunda* (20, 20), for the superior maxillary branch of the trigeminal nerve.

4. *Foramina ovalia* (22, 22), for the inferior maxillary branch of the trigeminal nerve.

5. *Foramina spinosa* (23, 23), for the middle artery of the dura mater.

6. *Foramina pterygoidea* (35, 35), at the roots of the pterygoid processes for the passage of the pterygoid nerve.

7. The *openings* (36, 36) of the sphenoidal sinuses on either side of the processus azygos. The *imperfect* are,

1. *Foramina carotica* (17, 17), in part formed by the temporal, and part by the sphenoid bone for the carotid artery.

2. *Foramina lacera basis cranii anteriora* (37, 37), completed by the temporal bone, and filled up naturally with ligament.

3. *Foramina spheno-palatina* (15, 15), formed by the sphenoid, and palate bones, for the passage of the spheno-palatine nerve into the nose.

4. *Foramina lacera orbitaria inferiora* (25, 25), formed by the sphenoid, palate, and superior maxillary bones.

Beside the foramina, the sphenoid bone, forms with the os palati, the *canalis pterygo-palatinus* (33, 33).

Junctions. The os sphenoides is joined by its ethmoidal spine and process to the nasal plate of the os ethmoides; by its transverso-spinous processes, and the inner upper edges of its orbitar plates to the orbitar plates and temporal edges of the os frontis; and at the upper and back part of its temporal plates with the sphenoidal angles of the ossa parietalia: by the posterior edges of the same plates and its spinous processes, it joins with the squamous portions of the ossa temporum; from its spinous processes to the roots of the pterygoid processes it touches slightly the inferior angles of the petrous portions of the ossa temporum, and by its basilar process with the sphenoidal process of the os occipitis: by the anterior edges of its orbitar plates it joins with the ossa malarum; by the anterior surfaces of its pterygoid plates with the ossa palati; and by the processus azygos to the vomer.

The *muscles* attached to the os sphenoides are thirteen pairs; viz. the M. levator palpebræ superioris, levator, depressor, abductor, adductor & obliquus superior oculi, temporalis, pterygoideus externus &

internus, buccinator, externus mallei, constrictor pharyngis superior, & tensor palati.

CHAP. VI.

Of the Sutures and the Basis of the Skull.

THE os ethmoides and os sphenoides, with the os frontis, ossa parietalia, os occipitis, and ossa temporum, complete the cranium, and form by their union the large cavity in which the brain and its membranes are placed, and this is called the BRAIN CASE, or SKULL.

The Skull is said to be of an ovate shape,* the narrowest part being in front, and the broadest behind; it is arched symmetrically above from before to behind, and from side to side; and it is irregularly concave below. Its anterior part, which is more or less perpendicular and broad, is called the forehead, *frons;* its upper part, which is generally flat, the top of the head, *vertex;* and behind is the hind head, *occiput;* the sides of the head are usually called the temples, *tempora;* the boundaries of which are, the temporal arches upon the frontal, parietal, and temporal bones; and the inferior surface forming the floor of the skull is called the external base, *basis externa*, which assists in forming several parts hereafter to be described and considered as belonging to the face.

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* See page 70.

THE SUTURES. *Suturæ.*

The bones of the skull, by their union with each other, form that sort of junction which is called *suture*, resembling very nearly the stitches employed in joining one piece of cloth to another; it is a kind of digitation or receiving of the small finger-like processes, formed by the edge of one bone, into those of the other; and the joint so produced is very strong but allows a slight yielding. Of these sutures there are seven; viz. the CORONAL, SAGITTAL, LAMBDOIDAL, two SQUAMOUS, ETHMOIDAL, and SPHENOIDAL.

1. *Sutura coronalis*, so called from being situated at that part of the head upon which the ancients were used to place the laurel or olive crown, given to the victors in their games. It commences about an inch behind the external angular process of the os frontis, passes vertically over, but rather inclining backwards, and descends to terminate at the same point on the opposite side of the skull. It joins the os frontis with the two ossa parietalia.

2. *Sutura sagittalis;* named from its straight course. It commences from the middle of the highest part of the coronal suture, runs directly backwards, and terminates at the occipital angle of the os occipitis. This termination is known in the living subject by continuing round the head that horizontal line from which the coronal suture takes its origin. It joins the two ossa parietalia. The sagittal suture is occasionally continued

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* No engraving of the Sutures is given, as with a skull before him, and having learned the bones already described, the student can follow them without difficulty.

down the os frontis to the nasal spine of that bone; which part of it is then called the *frontal suture.*

3. *Sutura lambdoidalis,* receives its name from its resemblance to the Greek Λ. It commences at the termination of the sagittal suture, and extends down into the posterior part of the foramen lacerum basis cranii posterius on each side. The situation of this suture may be described, by carrying a line from the termination of the sagittal suture downwards and outwards, immediately behind the root of the mastoid process, on each side of the skull. It joins the os occipitis with the ossa parietalia above, and the partes mamillares of the ossa temporum below. By some anatomists the junctions of the os occipitis with the ossa temporum are called *additamenta suturæ lambdoidalis.* In the lambdoidal suture, and not unfrequently in the sagittal, are found several little bones, which, from being of a triangular form, have been called *ossa triquetra;* they are not, however, to be considered distinct bones, but merely loose pieces, which by accident have not become ossified to the adjacent bone.

4 & 5. *Suturæ squamosæ.* So named from the overlapping of the bones like fish scales. One on each side commences about a quarter of an inch behind the lowest part of the coronal suture, rises up a little, and, forming part of an arch, descends and terminates in the lambdoidal suture, at the posterior superior point of the pars mamillaris of the os temporis. It joins the os temporis with the os parietale. That part of the suture, which connects the pars mamillāris of the os temporis with the temporal angle of the os parietale, is sometimes called *additamentum suturæ squamosæ;* the junction at this part is denticulated rather than serrated, whilst the superior

part of the suture is scaly, the edge of each bone being bevelled off, in such way, that though one bone overlaps the other, still there is no increase in the thickness of the skull opposite the squamous suture.

6. *Sutura ethmoidalis.* This unites the cribriform plate of the os ethmoides to the orbitar plates of the os frontis.

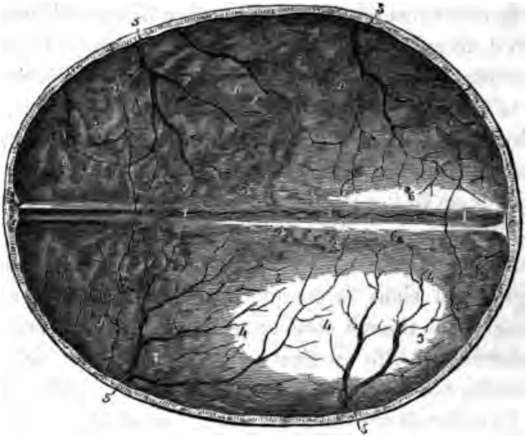
7. *Sutura sphenoidalis.* This suture is very extensive. It commences at the junction of the outer edge of the spinous process of the os sphenoides, with the inner edge of the glenoid cavity of the os temporis, passes a little forwards and upwards, and then directly upwards to the anterior part of the squamous suture, joining the temporal plate of the os sphenoides with the anterior part of the squamous portion of the os temporis; is then continued downwards and forwards, joining the upper edge of the temporal plate of the os sphenoides with the sphenoidal angle of the os parietale, and that edge of the os frontis which is found in the temporal fossa; it passes across the skull from the anterior point of the sphenoidal angle of one os parietale to the same part of the other, and in its course joins the upper edges of the orbitar plates, the transverso-spinous and ethmoidal processes of the os sphenoides, with the orbitar plates of the os frontis, and the cribriform plate of the os ethmoides; and it is continued between the frontal, parietal, and temporal bones above, and the sphenoid below, to terminate at the inside of the glenoid cavity.

Some of the sutures are very important, as they describe the course of the vessels of the brain; thus the sagittal suture points out that of the longitudinal sinus; the anterior superior point of the squamous suture contains the middle artery of the dura mater; the posterior inferior point of the same suture denotes the passage of the lateral sinus on each side; and a horizontal line extended round the os occipitis, from that point of one to the same point of the other suture, describes the course of the same sinus along the inside of the os occipitis, and defines the spot to which the tentorium is attached posteriorly. And so if a line be continued from the posterior termination of the sagittal suture to this line, and another from the anterior point of the same suture, down to the nasal process of the os frontis, the whole course of the longitudinal sinus is completely described. These are points which, though seemingly trivial in themselves, are, as connected with surgical practice, of the highest importance, and therefore particularly to be attended to.

In order to see the parts within the skull, it is necessary to make a transverse section of the os frontis, ossa parietalia, and os occipitis; this should be commenced about half an inch above the superciliary ridges, and carried through the tops of the squamous sutures, through the parietal angles and upper part of the occipitis. The vault of the cranium, thus removed, is called the skull-cap, *calvaria;* and the lower part on which the brain rests, the internal basis, *basis interna.* In the

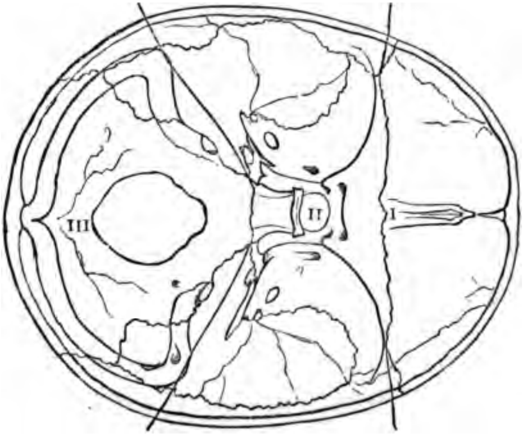
CALVARIA,

The parts to be observed are the longitudinal groove, *sulcus longitudinalis* (1, 1, 1), for the longitudinal sinus, with a number of little pits (2, 2, 2, 2), more or less deep, in which the glandulæ pacchionæ are situated: there are also the impressiones digitatæ (3, 3, 3, 3) and eminentiæ mamillares (4, 4, 4, 4), produced by the convolutions of the brain; the groovings for the meningeal arteries (5, 5), and the parietal holes (6, 6).



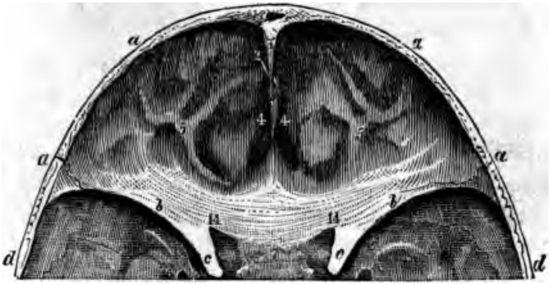
BASIS INTERNA.

The internal basis is divided into three portions, the



anterior, or *frontal* (I); the middle, or *sphenoido-temporal* (II); and the posterior, or *occipital* (III).

1. *Portio frontalis* (I), is bounded before and to the sides by the fronto-temporal portions of the os frontis (*a*, *a*), and behind by the transverso-spinous processes (*b*, *b*) of the os sphenoides. It has in the middle, in front the spine of the os frontis (1), to which the falx major of the dura mater is attached; at the root of which is the foramen cæcum (2); and behind it, the crista galli (3); to both of which the falx is also attached; on each side of the crista galli is the cribriform plate of the os ethmoides (4, 4); and further out, the orbitar plates of the os frontis (5, 5), upon which the anterior lobes of the cerebrum rest.

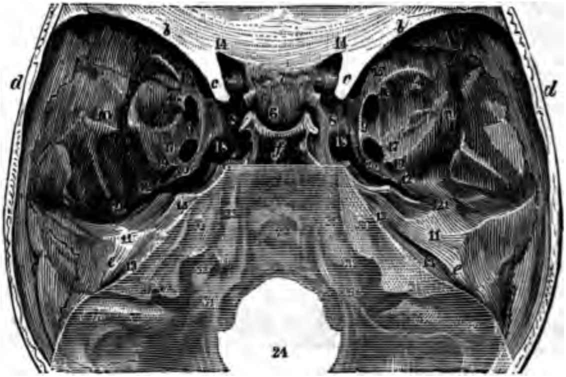


THE FORAMINA in this division are

Foramen cæcum (2), for the attachment of the dura mater, and sometimes the passage of a vein.

Foramina cribrosa (4, 4), for the passage of the olfactory and ethmoidal nerves into the nose.

2. *Portio sphenoido-temporalis* (II), bounded before by the transverso-spinous processes of the os sphenoides (*b*, *b*); on the sides by the squamous portions of the ossa temporum (*d*, *d*); and behind by the superior angles of the petrous portions (*e*, *e*) of the same bones, and the posterior clinoid process of the os sphenoides (*f*). It has in the middle, the sella turcica (6) for the lodgement of the pituitary gland of the brain, bounded behind by the posterior clinoid process (*f*); and before, by the two anterior clinoid processes (*c*, *c*); between which is the processus olivaris (7), and upon it the optic nerves join: extending outwards from the anterior clinoid, are the transverso-spinous processes (*b*, *b*); on each side of the sella turcica, but below it, is a groove (8, 8) for the carotid artery, and the cavernous sinus, and below that a shallow groove (9, 9) for the superior maxillary nerve; further out on each side, are the cavities (10, 10) to



lodge the middle lobes of the brain; behind, on the anterior surfaces of the petrous portions of the ossa temporum, are seen the juttings of the anterior legs of the vertical semicircular canals (11, 11), the canalis innominatus for the nervus innominatus, (12, 12), and the commencement of the superior petrosal sinuses (13, 13).

THE FORAMINA in this division are

Foramina optica (14, 14), for the passage of the optic nerves and ocular arteries into the orbits.

Foramina lacera orbitaria superiora (15, 15), for the passage of the common oculo-muscular, inner oculo-muscular, ophthalmic branch of the trigeminal, and outer oculo-muscular nerves, *out* of the skull, and the return of the ocular veins *into* it, to the cavernous sinus.

Foramina rotunda (16, 16), for the passage of the superior maxillary branch of the trigeminal nerve to the parts about the upper jaw.

Foramina ovalia (17, 17), for the passage of the inferior maxillary branch of the trigeminal nerve to the parts about the lower jaw.

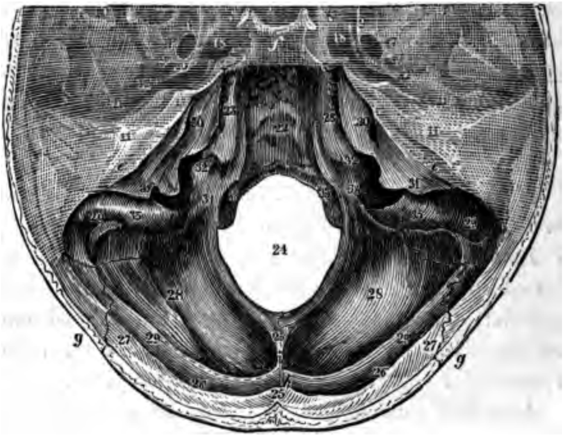
Foramina carotica (18, 18), for the entrance of the carotid arteries *into* the skull, and the passage of a branch of the outer oculo-muscular nerve *out* of it.

Foramina spinosa (19, 19), for the entrance of the middle artery of the dura mater.

Foramina lacera basis cranii anteriora (20, 20), filled up by membrane, in the recent state, and giving passage to the superficial branch of the pterygoid nerve.

Foramina innominata (21, 21), for the transmission of the nervi innominati to the stylo-mastoid canals.

3. *Portio occipitalis* (III), bounded before by the posterior clinoid process of the sphenoid (*f*) and the superior angles of the petrous portions of the ossa temporum (*e*, *e*), and behind by the os occipitis (*g*, *g*). It has in the middle, anteriorly, the basilar process (22), hollowed out in the middle for the pons varolii, and medulla oblongata, and grooved at the edges (23, 23), where it joins the petrous portions of the temporal bones for the inferior petrosal sinuses: behind the basilar process is the foramen magnum (24), extending up from the posterior edge of which is the perpendicular ridge (25, 25), of the os occipitis crossed by the transverse ridge (26, 26), by which the bone is divided into four cavities; the two upper (27, 27) for the posterior lobes of the cerebrum, the two lower (28, 28) for those of the cerebellum; the superior angles of the petrous portions of the ossa temporum and the transverse ridge of the os occipitis giving attachment to the tentorium; the former having each a



shallow groove (13, 13) for the superior petrosal sinuses, and the latter a deep one for the lateral sinuses (29, 29), which is continued down into the temporal angles of the os occipitis; the perpendicular ridge (25) giving attachment above the transverse to the falx major, and grooved for the longitudinal sinus (*h*), which terminates sometimes in the left, and at other times in the right lateral sinus; the same ridge (25) below the transverse ridge giving attachment to the falx minor, and slightly grooved (*i*) for the occipital sinuses.

THE FORAMINA in this division are

Foramina auditiva interna (30, 30), for the passage from the skull of the arteries of the labyrinth, the auditory and facial nerves.

Aquæductus vestibulorum (31, 31), for the evacuation of fluid from the vestibule.

Foramina lacera basis cranii posteriora (32, 32), for the passage of the glosso-pharyngeal, pneumo-gastric, and accessory nerves *from* the skull; and the junctions of the lateral sinuses with the internal jugular veins.

Foramen magnum (24), for the passage of the medulla oblongata and anterior arteries of the spinal marrow *from* the skull, and the entrance of the vertebral arteries and the accessory nerves *into* it.

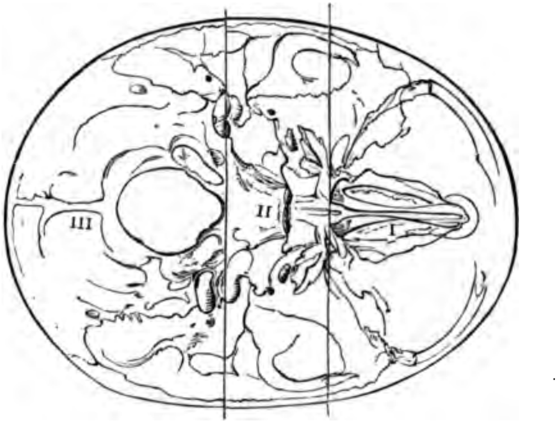
Foramina condyloidea anteriora (33, 33), for the passage of the lingual nerves from the skull.

Foramina condyloidea posteriora (34, 34), for the entrance of veins into the occipital sinus, are seen in the hinder edge of the foramina lacera posteriora (32, 32).

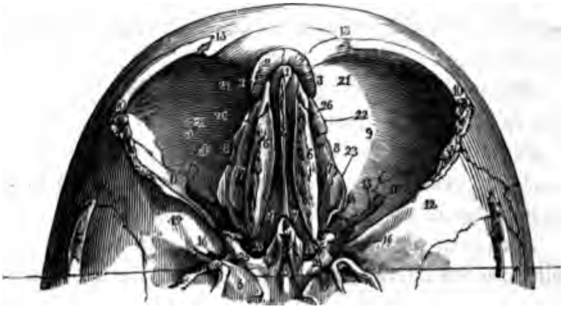
Foramina mastoidea (35, 35), for the passage of a vein into the lateral sinus: sometimes there is but one of these.

BASIS EXTERNA.

The external basis, like the internal, is also divided into three portions, the anterior, or *ethmoido-frontal* (I); the middle, or *sphenoido-temporal* (II); and posterior, or *occipital* (III).



1. *Portio ethmoido-frontalis* (I), bounded before by the superciliary ridges of the os frontis (*a*, *a*), and behind



by the roots of the pterygoid processes of the os sphenoides (*b*, *b*). It has anteriorly in the middle the nasal spine (1), and process of the os frontis (2, 2), bounded by the internal angular processes (3, 3); behind the spine is the nasal plate of the os ethmoides (4); and behind it the processus azygos of the sphenoid bone (5): on each side of the nasal plate of the ethmoid are the turbinated plates (6, 6) and convolutions (7, 7) of the same bone, bounded on the sides by its flat plates (8, 8); to their outer side are the orbitar plates of the os frontis (9, 9) bounded by its external angular processes before (10, 10), and by the orbitar plates of the os sphenoides behind (11, 11); and to their outer side the temporal plates of the same bone (12, 12).

THE FORAMINA in this division are

Foramina supra-orbitaria (13, 13), for the passage of the supra-orbitary nerves and vessels to the forehead.

Foramina frontalia (21, 21), sometimes only one, for the passage of a nerve into the frontal sinuses.

Foramina orbitaria interna, anteriora (22, 22), *& posteriora* (23, 23), the former two, for the entrance of the ethmoidal nerves into the skull; the latter two, for the passage of small arteries and nerves.

Foramina pterygoidea (25, 25), for the entrance of the pterygoid nerves into the pterygoid canals.

Openings (26, 26) of the frontal and anterior ethmoidal sinuses.

Openings (27, 27) of the posterior ethmoidal sinuses.

Openings (28, 28) of the sphenoidal sinuses.

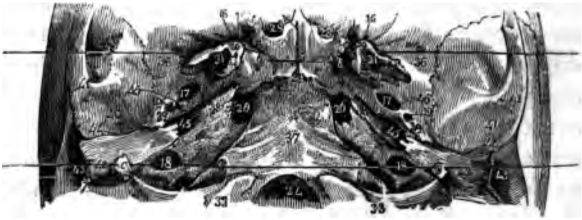
The preceding are not seen in the internal basis; the following are, viz.:

Foramina optica (14, 14).

Foramina lacera orbitaria superiora (15, 15).

Foramina rotunda (16, 16).

2. *Portio sphenoido-temporalis* (II), bounded before by the roots of the pterygoid processes of the os sphenoides (*b*, *b*), and the styloid processes of the ossa temporum (*c*, *c*) behind. It has in the middle anteriorly, the body of the os sphenoides (29); on either side of which, are the pterygoid processes of the same bone (30, 30), divided into two plates by the fossæ pterygoideæ (31, 31); and to their outer side a flat space (36, 36) for the origins of the M. pterygoidei externi; behind the body of the sphenoid is the basilar process (37), of the os occipitis; on its sides, the anterior points of the petrous portions (38, 38) of the ossa temporum; further out the spinous processes of the os sphenoides (39, 39), and to their outside the glenoid cavities of the ossa temporum (40, 40), bounded laterally, before by the roots of the zygomatic processes (41, 41), and behind by the auditory processes of the same bones (42, 42).



THE FORAMINA in this division are

Foramina auditiva externa (43, 43), the beginning of the external auditory passage.

Foramina glenoidea (44, 44), for the passage of the nervus chorda tympani and the tendon of the M. externus mallei.

Openings (45, 45) of the Eustachian tubes from the tympanum to the throat.

Neither of the above are seen in the Internal Basis; but the following are, viz.

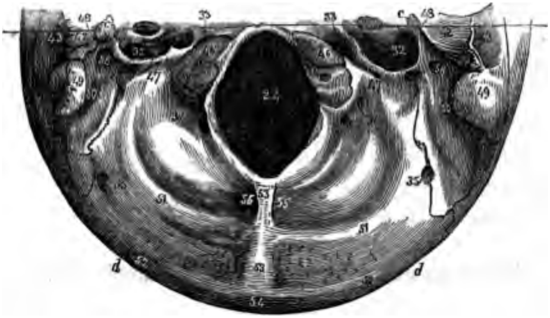
Foramina ovalia (17, 17).

Foramina carotica (18, 18).

Foramina spinosa (19, 19).

Foramina lacera basis cranii anteriora (20, 20).

3. *Portio occipitalis* (III), bounded before by the styloid processes of the ossa temporum (*c*, *c*), and behind by the os occipitis (*d*, *d*). It has in the middle, the foramen magnum (24); to the fore part of which are the processus condyloides (46, 46); on their outer side, a ridge for the attachment of the M. recti laterales capitis (47, 47): further out, and rather before, the styloid processes (*c*, *c*) of the ossa temporum, surrounded by their vaginal processes (48, 48): behind which, and rather more outward, the mamillary processes (49, 49), having at their roots



the digastric pits (50, 50); the os occipitis marked behind the foramen magnum, by the inferior (51, 51) and superior (52, 52) transverse arches, the spine, (53) protuberance (54), and pits (55, 55).

THE FORAMINA in this division are

" *Foramina stylo-mastoidea* (56, 56), for the passage of the facial nerves from the stylo-mastoid canals.

The above are not seen on the inside; but the following are,

Foramen magnum (24).
Foramina lacera basis cranii posteriora (32, 32).
Foramina condyloidea anteriora (33, 33).
Foramina condyloidea posteriora (34, 34).
Foramina mastoidea (35, 35).

CHAP. VII.

Of the Bones of the Face.[*]

THESE consist of six pairs and two single bones.

CHEEK BONES. *Ossa Malarum* (1).

Situation. At the outer and under part of the orbit and side of the face, forming the prominence of the cheek.

Description. The os malæ is of an irregular figure, and divided into three faces and five processes.

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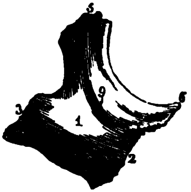
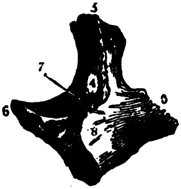
[*] For their relative position, see page 71.

1. *Superficies malaris* (1), in front and to the outer side, irregularly convex from before to behind; its anterior inner edge bounded by the maxillary process, *p. maxillaris* (2); its external posterior edge bounded by the zygomatic process, *p. zygomaticus* (3), and joining with the malar process of the os temporis to form the zygoma, under which the M. temporalis plays.



Anterior surface.



Posterior surface.

2. *Superficies orbitaris* (4), above forming the internal orbitar process, *p. orbitaris internus* (4), bounded above and to the outer side by the *p. orbitaris superior* (5), and below to the inside by the *p. orbitaris inferior* (6): on the internal orbitar process is seen a hole (7), which is the commencement of the passage leading to the malar hole.

3. *Superficies temporalis* (8), situated behind, irregularly concave, and completing the temporal pit, which is therefore composed of five bones, viz. os temporis, parietale, sphenoides, frontis, and malæ.

There is but one FORAMEN in this bone:

Foramen malare (9), the beginning of which (7) is seen in the orbitar surface (4), and its termination (9) on the malar surface (1): through it the malar nerve passes.

Junctions. The os malæ is joined by its zygomatic process to the malar process of the os temporis; by its superior orbitar process to the external angular process of the os frontis; by the posterior edge of its internal orbitar process with the orbitar plate of the os sphenoides; and by the inner edge of the same process and the inferior orbitar process with the os maxillare superius.

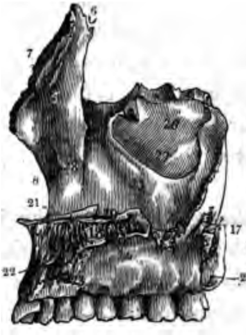
The *muscles* attached to it are four; viz., M. obliquus inferior oculi, zygomaticus major & minor, & masseter. The M. orbicularis palpebrarum extends over it.

SUPERIOR MAXILLARY BONES, OR UPPER JAW.

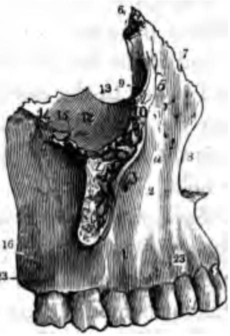
Ossa Maxillaria Superiora (2).

Situation. In the front of the face, between the cheek bones, forming a large part of the orbits, and the fore part of the nostrils, face, and palate.

Description. The superior maxillary bone is divided into body and processes. The *body* (1) is of an irregular figure and hollowed to form the maxillary sinus, ***antrum highmorianum vel sinus maxillaris*** (26); its anterior surface hollowed from above downwards, and from side to side, forming the infra-orbitar pit, ***fossa infra-orbitaris*** (2), in the upper part of which is the infra-orbitar hole,



Internal Surface.



External Surface.

foramen infra-orbitare (3): the body is bounded above and to the outer side, anteriorly, by an irregularly denticulated process, extending as far as opposite the infra-orbitar hole, called malar process, *processus malaris* (4), which projects most below, and is hollowed behind, for the play of the M. temporalis; to the inner side and above, springing up from the body, is the nasal process, *processus nasalis* (5), of a pyramidal form, having in its fore part a hole for an artery; it is rough (6) above to join with the os frontis, becomes prominent as it descends, and has its inner edge (7) grooved to receive the os nasi; below which is a notch (8) where the alar cartilages of the nose are attached; behind, and to the outer side above, the nasal process is concave, to form part of the lacrymal pit, *fossa lacrymalis* (9), in which the lacrymal sack is placed; and before it the bone is pinched up so as to form a sharp ridge (10), behind which the concavity of the pit descends, becomes wider, and forms part of the nasal duct, *ductus ad nasum* (11); between the malar and the nasal processes extending backwards is the orbitar plate, *lamella orbitaris* (12), of a triangular figure, the base of which facing inwards joins with the flat plate of the os ethmoides; and at its inner part is the lacrymal notch, *incisura lacrymalis* (13), in which the os lacrymale is received: its posterior edge (14) forms the lower part of the spheno-maxillary fissure, and has in it the beginning of the infra-orbitar canal, *canalis infra-orbitaris* (15), which runs along the orbitar plate forwards, and when about half an inch distant from the anterior edge of the orbit, dips down to terminate in the infra-orbitar hole (3): the posterior surface of the bone is rounded, and named the tuberosity, *tuber* *maxillare* (16), the inner edge of which (17) is rough to join with the pterygoid process of the os palati, and os sphenoides, forming with them the palato-maxillary canal and hole: from the inner and under part of the body, extends horizontally inwards, the palatine process *processus palatinus* (18), thin, about a finger's breadth, hollowed above from side to side, forming the greater part of the floor of the nose, and hollowed below to form as much of the roof of the mouth; it becomes much deeper at its inner edge, and rough, to join with its fellow, and form above the nasal crest, *crista nasalis* (19,) which is grooved to receive the vomer, and extending beyond the bony part of the nostrils, gives attachment to the cartilaginous septum of the nose; below the junction forms the palatine spine, *spina palatina* (20); at the anterior part of the floor of the nostril, close to the nasal crest, is the *foramen incisivum* (21), leading to the *ductus incisivus* (22); and at the back part, the palatine process is deeply notched, to receive the os palati: around the inferior, anterior, and external part of the body are sent down two alveolar processes, *processus alveolares* (23, 23), divided by alveolar plates, *lamellæ alveolares*, into alveolar cavities, *cavitates alveolares*, of which there are usually eight in each bone, to receive as many teeth: in the alveolar cavity of the second molar tooth, there is usually a hole of communication with the antrum; between the root of the inner alveolar process and the palatine plate, is a groove (24), along which the palatine artery and nerve pass to the ductus incisivus, which is formed by the junction of a notch in the anterior part of the palatine spine: above the floor of the nostril, and from its outer edge, rises up the side of the body (25), forming the inner boundary of the antrum (26), and the nasal process (5); in the former is the maxillary hole, *foramen maxillare* (27), by which the antrum communicates with the middle chamber of the nose: and upon the latter, just above and before the termination of the nasal duct, is a horizontal ridge (28), to which the anterior extremity of the os turbinatum is attached.

THE FORAMINA in the os maxillare superius are four, and one is formed by the junction of both bones.

Foramen infra-orbitare (3), for the exit of the infra-orbitar nerve and vessels from the canal.

Foramen maxillare (27), from the antrum into the nose.

Foramen incisivum (21), from the nostril into the ductus incisivus, for the anastomosis of the spheno-palatine, and palatine nerves and vessels.

The *opening* from the alveolar cavity of the second molar tooth into the antrum.

Ductus incisivus (22), formed by the junction of both the superior maxillary bones.

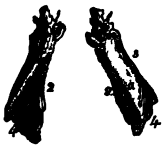
Besides these are found part of the *ductus ad nasum* (11), of the *fissura spheno-maxillaris* (14), and the anterior opening of the nostril (8).

Junctions. The os maxillare superius is connected by its malar process with the inferior orbitar process of the os malæ; by the anterior inner edge of its nasal process with the os nasi; and by the ridge on the inside of that process with the os turbinatum; by the upper part of the same process with the nasal process of the os frontis; by the posterior part of the same process, and its lacrymal notch with the os lacrymale; by the inner edge of its orbitar plate with the flat plate of the os ethmoides; by the posterior point of the same plate with the os palati; and by its tuberosity, body, and palatine process to the same bone; by the inner edge of its palatine process with that of its fellow; and by the nasal crest formed by the junction of both bones with the vomer.

The *muscles* attached to it are ten; viz. M. constrictor pharyngis superior, pterygoideus externus, buccinator, masseter, levator anguli oris, levator, & depressor labii superioris alæque nasi, orbicularis palpebrarum, obliquus oculi inferior, & compressor naris.

NASAL BONES. *Ossa Nasi* (3).

Situation. Immediately under the nasal process of the os frontis, and between the nasal processes of the ossa maxillaria superiora: these bones are of a small size, narrow and thick above, thin and expanded below; they form the bridge of the nose.

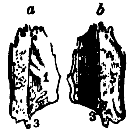


Description. The external surface of the os nasi (*a*) is slightly concave from above downwards, and convex from before to behind; after it has began to expand, the internal surface (*b*) is thick above, and concave from before to behind; it has four edges, the superior, *margo frontalis* (1), thick and deeply denticulated, to join with the nasal process and spine of the os frontis, and the nasal plate of the os ethmoides; its external edge, *margo maxillaris* (2), grooved, and received into the nasal process of the os maxillare superius; its inner edge, *margo* *nasalis* (3), flat, to join with its fellow; and its lower edge, *margo alaris* (4), thin and irregular, to join with the alar cartilages of the nose.

The *muscles* attached to it are two; viz. M. occipito-frontalis, & compressor naris.

LACRYMAL BONES. *Ossa Lacrymalia* (4).

Situation. The os lacrymale is placed at the fore and inner part of the orbit behind the nasal process of the os maxillare superius; and before the flat plate of the os ethmoides; it is of an oblong square shape, and very thin.



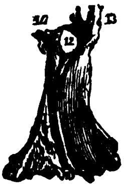
Description. Internally (*a*) it is hollow, and covers the anterior ethmoidal sinuses, forming the ethmoidal plate, *lamella ethmoidalis* (1); externally (*b*) it is divided by a perpendicular ridge (2), which terminates below in a little hook-like process (3) into two unequal plates, the posterior, of which the flattest, shortest, and broadest, is called the orbitar plate, *lamella orbitaris* (4); and the anterior, the lacrymal plate, *lamella lacrymalis* (5), is the most concave and narrow, but the longest.

Junctions. The os lacrymale is joined above to the internal angular and orbitar plates of the os frontis; behind, to the flat plate of the os ethmoides; below, to the orbitar plate of the os maxillare superius; before, to the nasal process of the same bone; and before and below, to the os turbinatum.

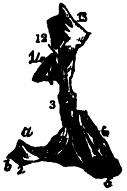
PALATINE BONES. *Ossa Palatina* (5).

Situation. At the under, outer, and back part of the nostrils, between the ossa maxillaria superiora before, and the pterygoid processes of the os sphenoides behind: they are of a very irregular figure.

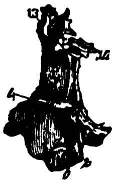
Description. The os palati is divided into palatine, nasal, pterygoid, orbitar, and sphenoidal processes: the *processus palatinus* (1), like that of the superior maxillary bone, is deepest on its inner edge, where it joins with its fellow, to complete the back part of the nasal crest above (*a*), and the palatine spine below (*b*); it projects back, forming a little spinous process (2), to which a muscle is attached; from the outer edge of the palatine rises up the nasal process, *p. nasalis* (3), forming part of the walls of the sinus maxillaris, and marked internally by a strong ridge (4), to which the os turbinatum is attached; behind the nasal process, and facing backwards, and rather outwards, is the pterygoid process, *p. pterygoideus* (5), having two grooves (6, 6) in it, to receive the pterygoid processes of the os sphenoides, and a middle ridge (7) which enters into the fissura pterygo-palatina of that bone; anteriorly this process is rough (8), where it joins with the tuberosity of the os maxillare superius and grooved where forming with it the palato-maxillary canal, *canalis palato-maxillaris* (9), terminating below in the



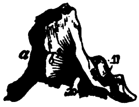
Anterior Surface.



Posterior Surface.



Internal Surface.



Inferior Surface.

palato-maxillary hole, *foramen palato-maxillare* (10), through which the palatine nerve and vessels pass to the palate; sometimes, indeed generally, there is another small hole behind, which is then called palatine hole, *foramen palatinum* (11), to transmit branches of the same vessels and nerve to the soft palate; above the nasal process, the bone springs out into two processes, divided by a notch (12), the anterior is the orbitar process, *p. orbitaris* (13), of a triangular shape, and received between the flat plate of the os ethmoides, and the orbitar plate of the os maxillare superius, to the inner and fore part, and the root of the pterygoid process of the os sphenoides behind, forming a covering to part of the ethmoidal sinuses; the posterior process is the sphenoidal process, *processus sphenoidalis* (14), which joins to the anterior inferior part of the body of the os sphenoides: the notch between the two processes forms the lower part of the spheno-palatine hole, *foramen spheno-palatinum* (12), the remainder of which is formed by the os sphenoides.

THE FORAMINA in this bone are two perfect and one imperfect. The two *perfect* are

Foramen palato-maxillare (10), formed by the junction of the palatine with the pterygoid process for the passage of the palatine vessels and nerves.

Foramen palatinum (11), for the passage of branches of the same nerve and vessels. The *imperfect* one is

Foramen spheno-palatinum (12), formed in part by the os palati, and in part by the os sphenoides, for the passage of the spheno-palatine nerve into the nose.

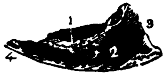
Junctions. The os palati joins to its fellow by the palatine process; and by their nasal crest to the vomer: by the anterior part of the palatine process to the same process of the os maxillare superius; by the ridge on the inside of the nasal process to the os turbinatum; by the nasal and pterygoid processes to the body and tuberosity of the os maxillare superius; by its pterygoid, sphenoidal, and orbitar processes to the pterygoid processes and body of the os sphenoides; and by its orbitar process to the same process of the os maxillare superius, and the flat plate of the os ethmoides.

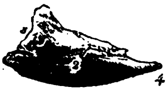
The *muscles* attached to and connected with the os palati, are five; viz. M. buccinator, pterygoideus externus & internus, constrictor pharyngis superior, & azygos uvulæ.

TURBINATED BONES. *Ossa Turbinata.*

Situation. On the outer sides of the cavities of the nostrils.

Description. The os turbinatum is composed of two unequal concave plates, joined together above, with their concavities facing towards each other; the outer plate (1), the narrowest, and joined to the body of os maxillare superius, forming part of the inner wall of the maxillary sinus; the inner plate (2) the broadest, and depending into the nose; its anterior edge (3) slightly concave, and attached to the ridge on the nasal process of the os maxillare superius, just touching the lacrymal plate of the os lacrymale, to complete the nasal duct; its posterior extremity (4) very acute, and attached to the ridge on the nasal process of the os palati.

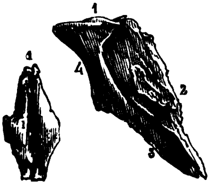




Junctions. Above and to the outer side, with the body of the os maxillare superius; anteriorly, to the nasal process of the same bone, and to the os lacrymale; and posteriorly, to the nasal process of the os palati.

PLOUGHSHARE BONE. *Vomer.*

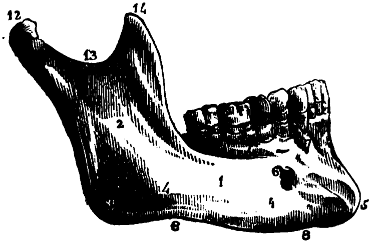
Situation. Between the cavities of the nose.



Description. The vomer is said to resemble a ploughshare. It is divided into four edges, the superior, or *sphenoidal* (1), the broadest, hollowed to receive the processus azygos of the os sphenoides; the anterior, or *nasal* (2), grooved to receive the nasal plate of the os ethmoides, and the cartilaginous septum of the nose; the inferior, or *cristal* (3) thin, to join with the nasal crest of the ossa maxillaria superiora and palatina; and the posterior, or *pharyngeal* (4), concave, and facing towards the pharynx.

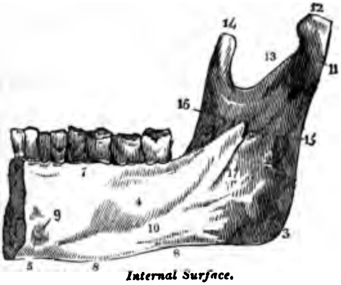
LOWER JAW. *Os Maxillare Inferius.*

Situation. Below all the other bones of the head, and forming the lower boundary of the face.



External Surface.

Description. The lower jaw is of a semi-elliptical form: it is divided into horizontal and ascending branches. The horizontal branches, *rami horizontales* (1), form the lower part of the bone, and together produce a semi-ellipsis, which is usually less than the upper jaw, so as to be received within it: when, however, the lower jaw extends beyond the upper, the jaw is said to be *under-*



Internal Surface.

hung: the diameter of the semi-ellipsis being behind, its points form the angles, *anguli* (3); extending forwards from which are the *sides* (4) of the jaw: the front, instead of being elliptical, is flattened from side to side, rather produced below, and called the chin, *symphysis* (5); at the parts where the symphysis and rami join, are seen the mental holes, *foramina mentalia* (6); the sides and chin are about two fingers deep, and terminated above by the *processus alveolares* (7, 7), divided by *lamellæ alveolares,* into *cavitates alveolares,* of which there are sixteen; the under edges of the rami (8, 8) are gibbous or thick, and rounded; within, the symphysis and rami horizontales form a similar curve; at the back of the symphysis is seen the mental spine, *spina mentalis* (9), which is sometimes bifid; and extending along the rami, is seen on either side, as far as the last dens molaris, a sharp line (10, 10) for the attachment of the M. mylo-hyoideus; behind this the line becomes more obtuse, and gives attachment to the M. buccinator. The ascending branches, *rami ascendentes* (2), rise up from the angles, and produce obtuse angles with the horizontal branches; they are broad from before to behind, pass upwards, and terminate in a narrow neck, *cervix* (11); on each side above which are the condyloid processes, *p. condyloides* (12), convex and narrow from before to behind, broad and slightly convex from side to side: before the neck is a sharp concavity (13), into which the M. pterygoideus externus is inserted; this is bounded anteriorly by the coronoid process, *p. coronoides* (14), which is angular, it passes down a little way sharp in front, and then divides into two legs, which are lost, one on the alveolar process, and the other on the side of the jaw; about an inch below the middle of the concavity, between the condyloid and coronoid processes, on the inside, are the inferior maxillary holes, *foramina maxillaria inferiora* (15), having a spinous process, *p. spinosus* (16), at the inner edge of each, for the attachment of a ligament; and from below this a furrow (17), runs downwards and forwards, in which a nerve rests. Between the inferior maxillary and mental holes, a canal, the infra-maxillary canal, *canalis infra-maxillaris*, runs within the bone, under the alveolar cavities for the lodgement of the dental nerve and vessels.

THE FORAMINA in this bone are two pairs.

Foramina maxillaria inferiora (15), through which the dental arteries and nerves enter the canal; and the

Foramina mentalia (6), by which they pass out.

Junction. By capsular and lateral ligaments with the glenoid cavities of the ossa temporum, having an interarticular cartilage between them.

The muscles attached to the os maxillare inferius are thirteen pairs; viz. *externally* M. masseteres, depressores anguli oris, depressores & levatores labii inferioris; *internally* M. temporales, pterygoidei externi & interni, buccinatores, constrictores pharyngis medii, mylo-hyoidei, genio-hyoidei, digastrici, & genio-hyo-glassi. The M. platysma myoides passes over it.

CHAP VIII.

Of the Orbits, Nostrils, Palate, and Ears.

Besides the braincase and auditory passages, the bones of the head form the cavities of the orbits, nostrils, palate, and ears.

1. THE ORBITS, *Orbitæ*,

Are two in number, and contain the organs of vision with their appendages.

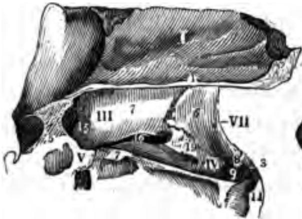
Situation. In the upper part of the face, above the cheeks, on either side of the nostrils, and immediately beneath the frontal bone.

They are irregularly conical cavities, having their bases facing forwards and outwards, and their apices inwards and backwards.

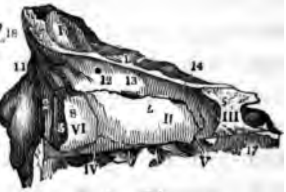
They are formed by *three* single bones, viz.

Os frontis (I), os ethmoides (II), and os sphenoides (III); and four pairs, viz.

Ossa maxillaria superiora (IV, IV), ossa palati (V, V), ossa lacrymalia (VI, VI), and ossa malæ (VII, VII). Each orbit, therefore, is formed of seven bones, but both orbits are composed of only eleven bones.



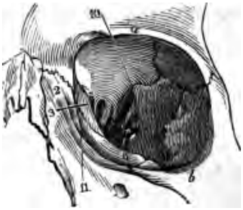
Outer Side.



Inner Side.

The processes of these several bones are thus situated. The orbitar process (1) of the frontal bone is placed *above*, and forms the entire vault of the orbit. On the *inner side* anteriorly is the nasal process (2) of the superior maxillary bone, behind which are the lacrymal and orbitar plates (3, 8) of the lacrymal bone, and posterior to it the flat plate of the ethmoid (4). In the *back* of the orbit is the outer part of the body of the sphenoid bone (5). On the *outer side* at the fore part is the orbitar plate (6) of the malar bone, and behind it the orbitar plate (7) of the sphenoid. *Below*, in front, is the inferior orbitar process (8′) of the malar bone, and behind it, forming the greater part of the floor of the orbit, the orbitar plate (9) of the superior maxillary bone.

THE FORAMINA in the orbits are ten pairs.



1. The large *openings of the orbits* (10) to which the eyelids are attached, composed of the superciliary ridge (*a*) of the frontal bone above, the margin of the malar bone (*b*), from its superior to its inferior orbitar process inclusive below, and the nasal process (2) of the superior maxillary bone.

2. The *superior orifices of the nasal ducts* (11) placed immediately behind the nasal process (2) of the superior maxillary bone, and formed by it and the lacrymal plate (3) of the lacrymal bone.

3. *Foramina frontalia* (12).

4. ———— *ethmoidea interna anteriora* (13).

5. ———— *ethmoidea interna posteriora* (14).

6. ———— *lacera orbitaria superiora* (15).

7. *Foramina lacera orbitaria inferiora* (16), seu *fissuræ spheno-maxillares.*
8. ——— *optica* (17).
9. ——— *supra-orbitaria* (18).

10. The *posterior openings of the infra-orbitar canals* (19), which commencing opposite the middle of the inferior lacerated holes, run forwards beneath the orbitar plate of the superior maxillary bone, to terminate at the infra-orbitar hole on the cheek.

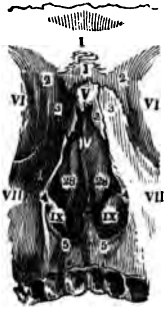
2. THE NOSTRILS, *Cava Nasalia,*

Are double, consisting of fourteen bones, viz. *four* single, viz.

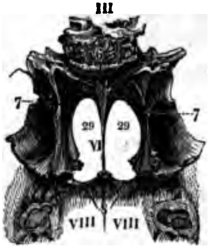
Os frontis (I); os ethmoides (II); os sphenoides (III); and vomer (IV); and *five* pairs, viz.

Ossa nasi (V V); ossa lacrymalia (VI VI); ossa maxillaria superiora (VII VII); ossa palatina (VIII VIII); and ossa turbinata (IX).*

The *anterior* boundary of the nostrils is formed



Anterior boundary.



Posterior boundary.

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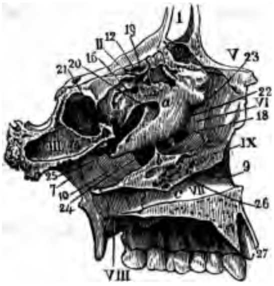
* It is well to observe that in order to save the multiplication of cuts, reference to several of the engravings not in the immediate neighbourhood of the descriptive part is necessary.

above by the nasal (1) and inner angular processes (2, 2) of the frontal bone, the nasal processes (3, 3) of the superior maxillary bones, and the nasal bones (v v); and on the sides by the notches (4, 4), and below by the palatine processes (5, 5) of the superior maxillary bones.

The *posterior* boundary is formed above by the body (6) of the sphenoid bone, on the sides by the nasal plates (7, 7) of the same bone, and below by the palatine processes (8, 8) of the palate bone.

The *lateral* boundaries consist below, of the bodies (9, 9) of the superior maxillary bones in front, and the nasal processes (10, 10) of the palate bones and the nasal plates (7, 7) of the sphenoid bone behind, and the insides of the orbits (11, 11) above.

The *superior* boundary, or roof, is formed by the nasal (1) and inner angular (2, 2) processes of the frontal bone, and the cribriform plates (12, 12) of the ethmoid before, and by the body (6) of the sphenoid bone behind.

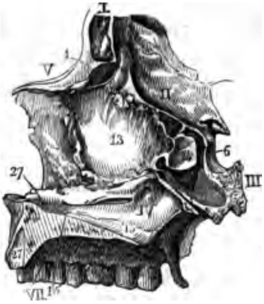


Lateral boundary.

The *inferior* boundary, or floor, consists of the palatine processes (5, 5) of the superior maxillary bones in front, and the palatine processes (8, 8) of the palate bones behind.

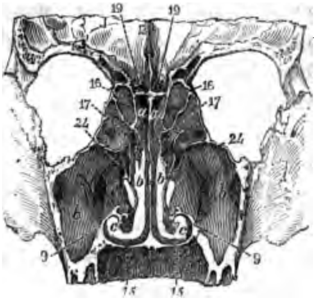
The two nostrils are separated by an imperfect partition, *septum*, which, in the recent state, is completed by cartilage. It consists of the nasal plate (13) of the ethmoid bone, which joins above and before with the nasal process (1) of the frontal bone, and behind with the body

(6) of the sphenoid bone; both these bones join behind and below with the vomer (IV), which is connected by its lower edge with nearly the whole length of the nasal crest (15, 15) of the superior maxillary and palate bones.



Partition of Nostrils.

Into the cavities of the nostrils depend, at the upper part the convolutions (16, 16) of the ethmoid bone, including its turbinated plates (17, 17), and towards the lower parts of the side walls the turbinated bones, (IX, IX) are attached from the hook-like process (18) of the lacrymal bone, along the superior maxillary and palate bones as far back as the nasal plates (7, 7) of the sphenoid. By the jutting of the turbinated plates of the ethmoid, and turbinated bones, each nostril is subdivided into three irregular cavities or chambers, *meatus.*



Transverse vertical section of Orbits, Nostrils, and Palate.

The superior chamber, *meatus superior* (*a*), includes the space between the cribriform plate (12) of the ethmoid above, and the lower edge of its turbinated plate (17) below. In it are

The openings of the cribrous holes (19, 19), of the posterior ethmoidal (20), and of the sphenoidal sinus (21), divided from its fellow by a bony plate (14).

The middle chamber, *meatus medius* (*b*), is the space contained between the turbinated plate (17) of the ethmoid above, and the turbinated bone (IX) below. In it are

The *openings* of the frontal (22), anterior ethmoidal (23), and maxillary sinus (24), and the spheno-palatine hole (25).

The inferior chamber, *meatus inferior* (*c*), is bounded above by the turbinated bone (IX), and below by the floor (5, 8) of the nostrils. In it, immediately below the junction of the turbinated with the lacrymal bones, is

The *opening* of the nasal duct (26′), and that of the ductus incisivus (27).

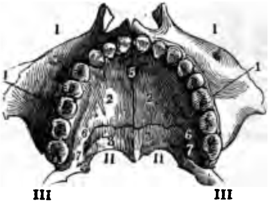
With all three chambers are connected

The anterior (28, 28) and posterior (29, 29) *openings* of the nostrils.

3. THE PALATE. *Fornix Palatinus.*

The bony structure of the palate consists of *two* pairs of bones and a *single* one, viz.

Ossa maxillaria superiora (I, I); ossa palatina (II, II); and ossa sphenoides (III).



The margin is formed by the alveolar processes (1, 1) of the superior maxillary bones, before and on the sides, and by the tips of the nasal plates (III, III) of the sphenoid behind; the arch of the palate by the palatine processes (2, 2) of the superior maxillary bones, and by the palatine processes (3, 3) of the palate bones. In it are seen five holes, viz. one single and two pairs.

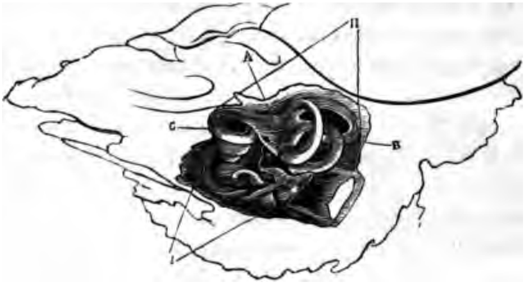
The opening of the *ductus incisivus* (5), at the fore part. And behind, close to the alveolar processes, the

2. *Foramina palato-maxillaria* (6, 6), and
3. ———— *palatina* (7, 7).

4. THE EAR, *Auris Interna.*

The bony part of the organ of hearing is principally contained in the petrous portion of the temporal bone, which is more fully developed at a very early period than either of the other portions; the evolution of which does not seem actually necessary, as not being perfected till the approach of manhood, and, even then, their existence seems to be rather supplementary than absolutely necessary.

The internal ear, as it is commonly called, consists of two parts: the drum, *tympanum* (I), with its canals, by which it is connected with the auricle and throat; and



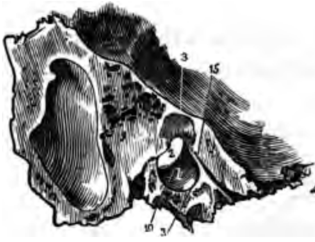
Relative situation of Tympanum and Labyrinth.

The above engraving is copied from Soemmering.

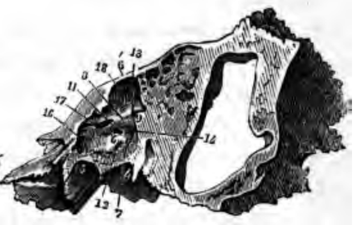
the labyrinth, *labyrinthus* (II), in which the nervous apparatus, in other words, the true auditory organ, is expanded, and by which it is protected.

THE DRUM. *Tympanum* (I).

The drum of the ear is placed on the under part of the petrous portion, at the bottom of a canal called the external auditory passage, *meatus auditorius externus* (1), commencing at the external auditory hole (2), and passing inwards and forwards about half an inch, till it meets with a ridge of bone (3) containing a groove, where it terminates. This ridge inclines outwards and backwards at its upper and hinder part, so that the passage is of greater length before and below, than behind and above. The membrane of the drum, which is received within the groove, consequently inclines downwards and inwards.

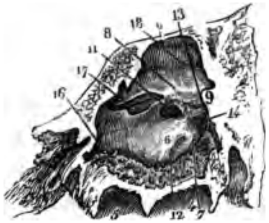


External section.



Internal section.

The drum is situated to the inner side of this ridge, and opposite to it, nearly in a parallel plane; is bounded by an irregular plate of bone (6), which separates it from the labyrinth: above it is protected by a thin plate of bone (6′), part of the anterior surface of the petrous portion, and below it is bounded by the top of the jugular pit (4) and carotid canal (5): it is of an oval form, and its greatest width, from within to without, is about three lines. Three projections are seen in it: one in the middle, upon the inner plate, called the promontory, *promontorium* (6), which resembles a hillock, surrounded by a deep irregularly circular trench, *sinus tympani* (7), above the upper part of which is seen the second, viz. the projection of the commencement of the stylo-mastoid canal (8), here distinctly exhibiting itself in the upper and back part of the drum: the third is the pyramid, *eminentia pyramidalis* (9), a minute eminence, standing forwards just below the point where the stylo-mastoid canal begins to disappear from the drum.



Internal section of tympanum magnified.

Nine principal apertures are found in the drum:

1. The large aperture (10) leading to the external auditory passage.

2. The vestibular hole, *Fenestra ovalis* (11), above the promontory, between it and the projection of the stylo-mastoid canal, and leading into the vestibule.

3. The cochlear hole, *Fenestra rotunda* (12), below the promontory, on its under part, and so overlapped by it as to be easily overlooked; this leads to the cochlea.

4. The aperture in the top of the pyramid (13), through which the tendon of the M. stapedius passes.

5. A very small hole, *apertura chordæ* (14), which runs into the stylo-mastoid canal behind and opposite the pyramid, and allows the passage of the Nervus chorda tympani into the drum, having traversed which, it quits by

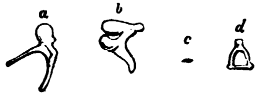
6. The glenoid hole, *foramen glenoideum* (15), at the fore and upper part.

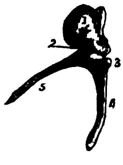
7. The opening of the Eustachian tube, *tuba Eustachiana* (16), large enough to admit the head of a probe, is situated at the inner and under part of the drum, and is the commencement of a canal, which gradually expands as it passes inwards to terminate before the foramen lacerum basis cranii anterius, in its cartilaginous part which opens into the throat.

8. The opening by which the M. tensor tympani enters the drum (17), is placed immediately before the front end of the vestibular hole, and is the termination of a bony canal running above the Eustachian tube, in which the muscle just named is contained.

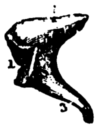
9. The large opening to the mastoidal cells (18), above the pyramid, and passing over the projection of the stylo-mastoid canal.

Contained in the cavity of the drum, are the four small bones, *ossicula auditus,* viz. the hammer (*a*), anvil (*b*), lenticular (*c*), and stirrup (*d*) bones.



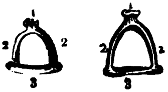


The hammer bone, *malleus* (*a*), has some resemblance to the thigh bone deprived of its condyles; it has a rounded head (1), a smooth, articular surface, connected by a short neck (2) to the shaft of the bone which; forming the short process, *processus brevis* (3), corresponds to the great trochanter: passing down from this, and tapering towards its tip, which curves slightly forwards, is the remainder of the shaft, which is called the handle, *manubrium* (4), and, from the front of the neck, curves forwards and downwards, the longest but most delicate process, which is of a flattened shape, and called the slender process, *processus gracilis* (5); this is very commonly broken short off at its root, and therefore not often seen.

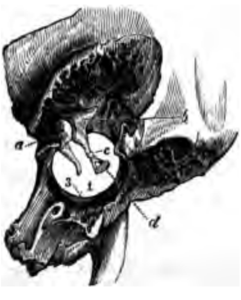


The anvil bone, *incus* (*b*), has great similarity to a double fanged grinding tooth; its head (1), which faces outwards, is hollowed to receive the head of the hammer bone; it has two processes: the short process, *processus brevis* (2), runs horizontally inwards from the head; and the long process, *processus longus* (3), descends nearly vertically, is of lighter form than the former, and its tip curves slightly inwards, receiving upon it,

The lenze bone, *os lenticulare seu rotundum* (*c*), which is the smallest bone in the body, not exceeding the size of a small pin's head, and often described as part of the anvil bone, with which it becomes anchylosed at an early period. Its shape resembles a lenze, whence its name.



The stirrup bone, *stapes* (*d*), rests on its side; a little projection on its outer end, hollowed to receive the lenze bone, is called the head (1), from which curve inwards two slender processes (2, 2), connected at their points by the base (3).

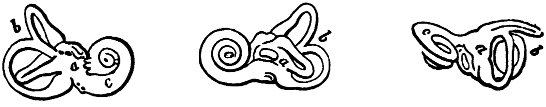


These four bones are connected together, forming a chain, which brings the membrane of the drum into connection with that of the vestibular hole, the hammer bone being attached by its handle to the tympanal, and the stapes by its base to the vestibular membrane.

The Labyrinth. *Labyrinthus.* (II).

The labyrinth is placed behind and to the inner side of the drum, in the most solid part of the petrous portion, and consists of three pieces: the vestibule (*a*), the semi-circular canals (*b*), and the cochlea (*c*).

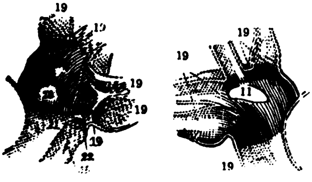
VIEWS OF LABYRINTH.



Posterior. *Anterior.* *Inferior.*

The vestibule, ***vestibulum*** (*a*), is placed posteriorly and to the inner side of the drum, and immediately behind the fenestra ovalis (11); within, before, and below, it is bounded by the cochlea, and above and behind by the semicircular canals: its size is about that of a grain of wheat, and it has in it several apertures; on the fore and outer part is the vestibular hole (11), on the outer and back part are the five openings of the semicircular canals (19); on the inner part, directly opposite the fenestra, the opening (20) by which the auditory nerve enters the vestibule; on the fore and under part is a hole leading to the cochlea (21); and at the posterior and inner part, near the common orifice of the vertical and oblique semicircular canals, is the orifice of the aqueduct, ***aquæductus vestibuli*** (22),

Vertical Section.



Posterior, *Anterior,*
Internal Surface.

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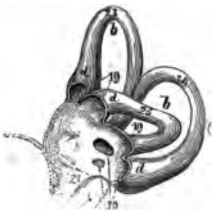
* All the succeeding Engravings, except the last, are copied from Soemmering.

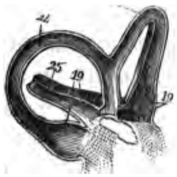
which passes to terminate on the posterior surface of the petrous portion.

The semicircular canals, *canales semicirculares* (*b*), of which there are three, are situated above and to the outer side of the vestibule, and immediately behind the tympanum; they are three in number; their name implies their form, and their extremities swelling out, each like a flask, have been thence called *ampullæ* (*d*). They are named from their position vertical or superior (23), oblique or posterior (24), and horizontal or inferior (25); and each leg opens by a distinct aperture into the vestibule, except the posterior leg of the vertical, and the superior of the oblique, which terminate in a common orifice, so that there are but five apertures from them in the vestibule.



Anterior View.

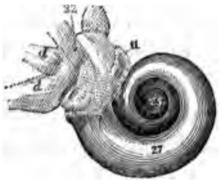
Section of Canals.



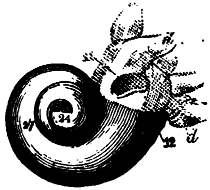
Anterior internal Surface.

The *os temporis* consists only of two portions, which are separate, viz. the squamous and petrous; the mamillary portion not being formed till some years after birth.

The *cochlea* (*c*) is placed immediately to the inner side of the promontory and vestibule; its form resembles



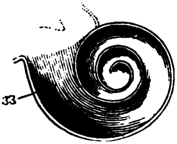
Base.



Apex.

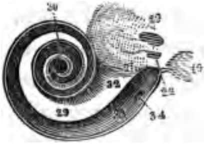
that of a snail shell, its base (35) facing backwards and upwards forms the bottom of the internal auditory passage, its apex (24) depending forwards rests against the back of the beginning of the Eustachian tube; it is composed of a central pillar of a conical form, called the *modiolus* (26), and two and a half turns of a spiral tube (27) wound around it, the apex of which forming the apex of the cochlea is called the *cupola* (28). This spiral tube is imperfectly divided into two passages called *scalæ*, by a thin plate of bone called *lamina spiralis* (29), which, commencing from the promontory, makes two and a half turns around the modiolus, and terminates in a hook-like tip, called the hook, *hamulus* (30), which is received into a funnel-like process, called the *infundibulum* (31), projecting into the cochlea from the inside of the cupola; the upper of these passages is called the *scala vestibuli* (32), commencing from the hole at the upper inner part of the vestibule, and having made its turns, reaches the hamulus and infundibulum where it terminates in the lower passage, the *scala tympani* (33), which, in like manner, makes its turns and terminates at the fenestra rotunda. The whole of these passages are freely pierced by numerous holes for nerves which have already perforated the cribriform base (35) of the modiolus. Besides these, close

Anterior internal surface of spiral tube;



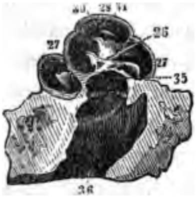
the lamina spiralis removed.

Lamina spiralis;



the external shell of the cochlea removed.

Horizontal section



through tube, lamina, modiolus and meatus internus.

to the termination of the scala tympani, immediately in front of the fenestra rotunda, is another opening, that of the *aquæductus cochleæ* (34), which terminates in the jugular pit, on the under part of the petrous portion. The base (35) of the modiolus faces backwards, and forms the anterior boundary of the internal auditory passage (36).

CHAP. IX.

Of the peculiarities in the bony structure of the Fœtus.

All the long bones are composed of several parts, viz. the body and the *epiphyses;* the latter really include all the projections which in the adult state become *processes*, but the term is more generally and especially applied only to the ends of the long bones. These three (as they are commonly enumerated) pieces, viz. the body and the extremities of the long bones, are the parts in which ossification commences in as many distinct points, and it is only as the earthy deposit proceeds that the several portions ultimately become connected. Indeed the shaft and extremities of a long bone seldom form one single mass till eighteen or twenty years of age; prior to that period the bone, if macerated, falls into three pieces, more or less perfectly formed, according to the age of the individual.

The bones of the skull are quite rudimental in the fœtus, so as to enable the head to mould itself to the pelvis, whilst passing through it during parturition.

The *os frontis* is divided into two portions by the continuation of the sagittal suture into the ethmoidal fissure.

The *os temporis* consists only of two portions, which are separate, viz. the squamous and petrous; the mamillary portion not being formed till some years after birth.

The *os occipitis* is divided into four pieces, the crucial ridge not having become ossified.

The *ossa parietalia* have neither their frontal nor occipital angles formed; and consequently two large chasms exist, one in front with the frontal bone, which is deficient at that spot; and the other behind with the occipital bone, which is also deficient; these two openings are called the fontanels, *bregmata vel fontanellæ*, of which the anterior is called the greater, and the posterior the lesser fontanel.

THE END.

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